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TRANSACTIONS

OF THE

AMERICAN CLIMATOLOGICAL ASSOCIATION.

FOR THE YEAR 1904.

VOLUME XX.

"The object of this Association shall be the study of Climatology and Hydrology and of Diseases of the Respiratory and Circulatory Organs."—*Constitution.*

PHILADELPHIA:
PRINTED FOR THE ASSOCIATION.
1904.

NOTICE.

The Association assumes no responsibility for the statements and opinions expressed in the papers read at its meetings.

Copies may be had of the Secretary.

VOL. XI. contains a complete Index of 11 volumes.

DORNAN, PRINTER.

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President.

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1905.

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ROLAND G. CURTIN, M.D., PHILADELPHIA, *Alternate.*

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LIST OF OFFICERS.

Presidents.

NAME.	YEAR.
A. L. Loomis	1884–5.
William Pepper	1886.
Frank Donaldson	1887.
A. L. Loomis	1888.
V. Y. Bowditch	1889.
Charles Denison	1890.
F. I. Knight	1891.
W. E. Ford	1892.
R. G. Curtin	1893.
A. H. Smith	1894.
S. E. Solly	1895.
J. B. Walker	1896.
E. Fletcher Ingals	1897.
E. O. Otis	1898.
Beverley Robinson	1899.
Abraham Jacobi	1900.
Robert H. Babcock	1901.
Samuel A. Fisk	1902.
Norman Bridge	1903.
James C. Wilson	1904.
W. F. R. Phillips	1905.

Vice-Presidents.

F. I. Knight, W. H. Geddings	1884–5.
Frank Donaldson, Beverley Robinson	1886.
V. Y. Bowditch, R. G. Curtin	1887.
A. Y. P. Garnett, J. T. Whittaker	1888.
J. R. Leaming, E. T. Bruen	1889.
A. L. Gihon, H. B. Baker	1890.

E. L. Trudeau, T. S. Hopkins	1891.
E. Fletcher Ingals, Beverley Robinson	1892.
A. H. Smith, E. O. Otis	1893.
I. Hull Platt, E. L. Trudeau	1894.
John H. Musser, G. R. Butler	1895.
Charles E. Quimby, James A. Hart	1896.
S. A. Fisk, John C. Munro	1897.
Beverley Robinson, C. F. McGahan	1898.
James A. Hart, R. C. Newton	1899.
R. H. Babcock, J. W. Brannan	1900.
Albert C. Peale, S. W. Langmaid	1901.
Norman Bridge, W. F. R. Phillips	1902.
James C. Wilson, H. S. Orme	1903.
Thomas Darlington, Thomas D. Coleman	1904.
S. G. Bonney, S. D. Risley	1905.

Secretaries and Treasurers.

James B. Walker	1884–95.
Guy Hinsdale	1895.

LIST OF MEMBERS.

Honorary Members.

ELECTED

1903. Tyndale, J. Hilgard, Richards Block, Lincoln, Nebraska.

1897. Weber, Sir Hermann, 10 Grosvenor Street, W., London, England.

1897. Williams, Charles Theodore, 2 Upper Brook Street, W., London, England.

Corresponding Members.

1898. Eyre, G. G., Claremont, Cape Town, South Africa.

1898. Gache, Samuel, 729 Corrientes Street, Buenos Ayres, South America.

1898. Liceaga, Eduardo, 4 San Andres Street, Mexico.

1898. Orvananos, Domingo, 25 Chavarri Street, Mexico.

1904. Sandwith, Fleming Mant, 31 Cavendish Square, London, and Cairo, Egypt.

1898. Sunderland, Septimus, 11 Cavendish Place, Cavendish Square, W., London.

1902. Weber, F. Parkes, 19 Harley Street, W., London.

1898. Wragge, Clement L., Brisbane, Queensland, Australia.

Active Members.

1888. Abbot, Griffith E., Hot Springs, N. C.

1897. Alden, C. H., Brigadier-General, U. S. A. (retired), P. O. Box 576, Redlands, Cal.

1897. Alton, Charles D., 86 Farmington Avenue, Hartford, Conn.

1898. Anders, Howard S., 1836 Wallace Street, Philadelphia.

1899. Anders, James M., 1605 Walnut Street, Philadelphia.

1890. Anderson, B. P., 106 North Cascade Avenue, Colorado Springs, Col.

1900. Arnold, Horace D., 427 Beacon Street, Boston.

ELECTED

1893. Babcock, R. H., 92 State Street, Chicago.
1898. Baldwin, Edward R., Saranac Lake, N. Y.
1901. Barlow, W. Jarvis, Wilcox Building, Los Angeles, Cal.
1898. Battle, S. Westray, Asheville, N. C.
1885. Bell, A. N., 337 Clinton Street, Brooklyn.
1896. Bergey, David H., Laboratory of Hygiene, University of Pennsylvania, Philadelphia.
1902. Bergtold, William H., 1460 Clayton Street, Denver, Col.
1896. Bernardy, E. P., 221 South 17th Street, Philadelphia.
1897. Blackader, Alexander D., 236 Mountain Street, Montreal, Canada.
1895. Boardman, W. S., 57 Hancock Street, Boston.
1897. Bonney, S. G., Stedman Building, Denver, Col.
1884. Bosworth, F. H., 41 Park Avenue, New York.
1885. Bowditch, V. Y., 506 Beacon Street, Boston.
1901. Bracken, Henry Martyn, 1010 Fourth Street, Minneapolis, Minn.
1891. Brannan, John W., 11 West 12th Street, New York City.
1894. Bridge, Norman, 217 South Broadway, Los Angeles, Cal.
1903. Brown, Lawrason, Saranac Lake, New York.
1903. Brown, Philip King, 1205 Van Ness Avenue, San Francisco, Cal.
1897. Brown, Sanger, Reliance Building, Chicago.
1890. Buckley, J. J., Missoula, Mont.
1886. Butler, G. R., 229 Gates Avenue, Brooklyn.

1896. Campbell, W. A., 424 North Nevada Avenue, Colorado Springs, Col.
1898. Casselberry, W. E., 34 Washington Street, Chicago, Ill.
1898. Chappell, Walter F., 7 East 55th Street, New York.
1898. Cleemann, Richard A., 2135 Spruce Street, Philadelphia.
1901. Cobb, J. O., U. S. M. H. S., Los Angeles, Cal.
1894. Coleman, Thomas D., 563 Greene Street, Augusta, Ga.
1901. Collins, Charles Farnham, 50 West 55th Street, New York City.
1889. Coolidge, A., Jr., 613 Beacon Street, Boston.
1902. Craig, R. W., Phœnix, Ariz.
1885. Curtin, R. G., 22 South 18th Street, Philadelphia.

ELECTED

1892. Daland, Judson, 317 South 18th Street, Philadelphia.
1890. Darlington, Thomas, King's Bridge, New York City.
1897. Davis, N. S., Jr., 65 Randolph Street, Chicago.
1884. Denison, Charles, 823 14th Street, Denver.
1902. Duffield, William, Phœnix, Ariz.

1897. Edson, Carroll E., McPhee Building, Denver, Col.
1903. Edwards, William A., Braly Building, Los Angeles, Cal.
1903. Elliott, J. H., Gravenhurst, Ontario, Canada.
1892. Elsner, H. L., Fayette Park, Syracuse, N. Y.

1887. Fisk, Samuel A., Denver Club, Denver, Col.
1902. Flint, W. H., Santa Barbara, Cal.
1885. Ford, Willis E., 266 Genesee Street, Utica, N. Y.
1897. Futterer, Gustav, 34 Washington Street, Chicago.

1896. Gardiner, C. F., 818 North Cascade Avenue, Colorado Springs, Col.
1886. Garnett, A. S., Hot Springs, Ark.
1898. Getchell, Albert C., 6 Linden Street, Worcester, Mass.
1892. Gibson, William M., 260 Genesee Street, Utica, N. Y.
1884. Glasgow, W. C., 2847 Washington Avenue, St. Louis.
1901. Guthrie, George W., 109 South Franklin Street, Wilkesbarre, Pa.

1893. Hance, I. H., Lakewood, N. J.
1891. Hart, James A., Colorado Springs, Col.
1900. Harvey, Thomas W., 463 Main Street, Orange, N. J.
1896. Heffron, John L., 528 South Salina Street, Syracuse, N. Y.
1893. Hinsdale, Guy, Hot Springs, Va.
1902. Hoagland, Henry W., 327 North Nevada Avenue, Colorado Springs, Col.

1884. Ingals, E. Fletcher, 34 Washington Street, Chicago.

1889. Jacobi, A., 19 East 47th Street, New York.
1904. Jacobs, Henry Barton, 11 Mt. Vernon Place, W., Baltimore.
1888. Jayne, W. A., 416 McPhee Building, Denver, Col.
1901. Jennings, Charles Godwin, 457 Jefferson Street, Detroit, Mich.

ELECTED

1897. Johnson, Frank S., 2521 Prairie Avenue, Chicago.
1893. Judd, L. D., 3603 Powelton Avenue, Philadelphia.

1904. King, Herbert Maxon, Liberty, N. Y.
1899. Klebs, Arnold C., 100 State Street, Chicago.
1884. Knight, Frederick I., 195 Beacon Street, Boston.
1903. Kyle, D. Braden, 1517 Walnut Street, Philadelphia.

1887. Langmaid, S. W., 71 Newbury Street, Boston.
1899. Le Fevre, Egbert, 52 West 56th Street, New York.
1903. Lindley, Walter, 1414 South Hope Street, Los Angeles, Cal.
1904. Little, Wilbur T., Cañon City, Col.
1896. Loomis, Henry P., 58 East 34th Street, New York.
1904. Lowman, John H., 441 Prospect Street, Cleveland, O.
1902. Lyle, B. F., 4 W. 7th Street, Cincinnati, O.

1902. McBride, James H., Pasadena, Cal.
1894. McGahan, C. F., Aiken, S. C., and Bethlehem, N. H.
1902. Marvel, Philip, 1616 Pacific Avenue, Atlantic City, N. J.
1887. Mays, Thomas J., 1829 Spruce Street, Philadelphia.
1899. Minor, Charles L., Asheville, N. C.
1886. Musser, John H., 1927 Chestnut Street, Philadelphia.

1900. Nammack, Charles E., 42 East 29th Street, New York.
1895. Newton, R. C., 42 Church Street, Montclair, N. J.
1899. Norrie, V. H., 21 West 37th Street, New York.
1888. Nunn, Richard J., 119 York Street, Savannah.

1884. Orme, H. S., 214 Douglas Building, Los Angeles, Cal.
1888. Otis, E. O., 381 Beacon Street, Boston.

1887. Peale, A. C., 605 12th Street, N. W., Washington, D. C.
1893. Peterson, Frederick, 4 West 50th Street, New York.
1895. Phillips, W. F. R., 1607 16th Street, N. W., Washington, D. C.
1885. Platt, Isaac Hull, Bryn Mawr, Pa.
1887. Platt, Walter B., 802 Cathedral Street, Baltimore.
1902. Pottenger, F. M., O. T. Johnson Building, Los Angeles, Cal.
1904. Prioleau, William H., Asheville, N. C.

ELECTED

1891. Quimby, Charles E., 44 West 36th Street, New York.

1891. Ransom, C. C., 66 West 49th Street, New York (Richfield Springs).
1884. Reed, Boardman, 1831 Chestnut Street, Philadelphia.
1885. Rice, C. C., 123 East 19th Street, New York.
1901. Richardson, Charles W., 1317 Connecticut Avenue, Washington, D. C.
1904. Richer, A. J., 87 Union Avenue, Montreal, Canada.
1893. Risley, S. D., 1824 Chestnut Street, Philadelphia.
1899. Rives, William C., 1723 I Street, Washington, D. C.
1884. Robinson, Beverley, 42 West 37th Street, New York.
1890. Robinson, W. D., 2012 Mount Vernon Street, Philadelphia.
1902. Rochester, Delancey, 469 Franklin Street, Buffalo, N. Y.
1892. Roe, John O., 28 North Clinton Street, Rochester, N. Y.
1890. Rogers, E. J. A., 222 Colfax Avenue, Denver, Col.
1889. Ruck, Carl von, Asheville, N. C.

1884. Schauffler, E. W., 3835 Wyandotte Street, Kansas City, Mo.
1901. Sewall, Henry, 23 Eighteenth Avenue, Denver, Col.
1884. Shurly, E. L., 32 Adams Avenue, West Detroit, Mich.
1890. Smith, A. Alexander, 18 West 51st Street, New York.
1885. Smith, Andrew H., 18 East 47th Street, New York.
1887. Smith, Frank Fremont, 1713 I Street, Washington, D. C.
1887. Solly, S. E., 2 North Cascade Avenue, Colorado Springs, Col.
1900. Stengel, Alfred, 1811 Spruce Street, Philadelphia.
1904. Stone, Arthur K., 543 Boylston Street, Boston, Mass.
1898. Stubbert, J. Edward, Hotel Belleclaire, 77th Street, New York.
1901. Swan, Will Howard, 706 North Nevada Avenue, Colorado Springs, Col.

1892. Taylor, H. Longstreet, 75 Lowry Arcade, St. Paul, Minn.
1896. Taylor, J. Madison, 1504 Pine Street, Philadelphia.
1885. Trudeau, E. L., Saranac Lake, N. Y.

1884. Walker, James B., 1617 Green Street, Philadelphia.
1891. Watson, E. W., 131 North 20th Street, Philadelphia.

ELECTED

1895. Weber, Leonard, 25 West 46th Street, New York.
1897. Whitcomb, H. H., Norristown, Pa.
1898. Whitney, Herbert B., 726 14th Street, Denver, Col.
1904. Wilder, John Archibald, Denver, Col.
1898. Williams, Francis H., 505 Beacon Street, Boston.
1885. Williams, H. F., 197 Gates Avenue, Brooklyn.
1898. Williams, Harold, 528 Beacon Street, Boston.
1884. Wilson, James C., 1509 Walnut Street, Philadelphia.
1901. Wyman, Walter, Surgeon-General, U. S. Public Health and Marine Hospital Service, Washington, D. C.

Total, 139 active members.

MINUTES.

The Twenty-first Annual Meeting of the American Climatological Association was called to order by the President, Dr. J. C. Wilson, at 9.50 A.M., on June 2, 1904, at the Aldine Hotel, Philadelphia, Pa. The President, Dr. Wilson, then delivered the Annual Presidential Address, and announced the opening of the regular programme.

The following members were present during the sessions:

Dr. Charles D. Alton,
Dr. H. S. Anders,
Dr. J. M. Anders,
Dr. R. H. Babcock,
Dr. E. R. Baldwin,
Dr. W. J. Barlow,
Dr. D. H. Bergey,
Dr. W. H. Bergtold,
Dr. E. P. Bernardy,
Dr. S. G. Bonney,
Dr. H. M. Bracken,
Dr. John W. Brannan,
Dr. Lawrason Brown,
Dr. W. E. Casselberry,
Dr. R. A. Cleemann,
Dr. J. O. Cobb,
Dr. T. D. Coleman,
Dr. C. F. Collins,
Dr. R. G. Curtin,
Dr. J. Daland,
Dr. T. Darlington,
Dr. N. S. Davis, Jr.,
Dr. C. E. Edson,
Dr. J. H. Elliott,
Dr. S. A. Fisk,
Dr. W. H. Flint,
Dr. A. C. Getchell,
Dr. W. M. Gibson,
Dr. G. W. Guthrie,
Dr. I. H. Hance,
Dr. J. A. Hart,
Dr. G. Hinsdale,
Dr. E. F. Ingals,
Dr. A. Jacobi,
Dr. W. A. Jayne,
Dr. A. C. Klebs,
Dr. F. I. Knight,
Dr. B. F. Lyle,
Dr. J. H. McBride,
Dr. C. F. McGahan,
Dr. T. J. Mays,
Dr. C. L. Minor,
Dr. J. H. Musser,
Dr. V. H. Norrie,
Dr. E. O. Otis,
Dr. W. F. R. Phillips,
Dr. C. E. Quimby,
Dr. Boardman Reed,

Dr. S. D. Risley,
Dr. W. C. Rives,
Dr. Beverley Robinson,
Dr. W. D. Robinson,
Dr. Delancey Rochester,
Dr. Carl von Ruck,
Dr. Henry Sewall,
Dr. S. E. Solly,
Dr. Alfred Stengel,
Dr. H. L. Taylor,
Dr. J. M. Taylor,
Dr. J. B. Walker,
Dr. H. H. Whitcomb,
Dr. J. C. Wilson.

Twenty-seven papers were read during the three days of the meeting. On the second day the sessions were held at the Houston Hall of the University of Pennsylvania; members were invited to luncheon, and in the evening the annual banquet was served at the Aldine Hotel, fifty-eight members being present. This was particularly enjoyable. The President, who acted as toastmaster, introduced all the ex-Presidents and many other members of the Association. On the previous evening the Society was entertained by the members from Philadelphia and vicinity, who arranged a trolley trip to Willow Grove, where dinner was served and where excellent music was enjoyed. The ladies accompanying the members shared in this delightful entertainment. Old friendships were cemented and new ones formed, and the traditional good fellowship of the Association fully maintained.

The Business Session was opened at 1 P.M., June 2d. The minutes of the previous meeting having been printed in the annual volume, their reading was dispensed with.

The President then appointed the following committees: Auditing Committee, Dr. H. M. Bracken and Dr. J. H. Elliott; Nominating Committee, Dr. Henry Sewall, Dr. C. F. McGahan, and Dr. E. O. Otis.

All further business was deferred until the following day. The Society then adjourned.

On the second day the Business Session was called to order at 12 o'clock.

Dr. Guy Hinsdale read his report as Secretary and Treasurer.

The Association, during the past year, has lost two members by death and four have resigned. Dr. F. Savary Pearce, who died on May 27th of the present year, was elected in 1900. He was a man of attractive personal character, and leaves a wide circle of friends. Born in Ohio in 1867, he graduated in medicine at the University of Penn-

sylvania in 1891. He was professor of nervous and mental diseases in the Medico-Chirurgical College; chairman of the Section on Nervous Diseases of the American Medical Association; a fellow of the College of Physicians of Philadelphia, and a member of the Neurological and Pathological Societies of Philadelphia. He was the author of a text-book on nervous diseases, just published, and a very hard worker. Overwork unquestionably caused his death.

We have also lost by death Dr. E. A. de Schweinitz, of Washington, D. C. Dr. de Schweinitz was dean of the Medical Department of Columbian University and chief of the Biochemical Division of the United States Department of Agriculture. His researches on the chemistry of tuberculin have attracted wide attention, and have been communicated to this Association. He was elected in 1901, and his death removes from our midst a valuable member.

The following have resigned: Dr. Calvin Dewitt, U. S. A.; Dr. John C. Munro, Dr. H. B. Baker, and Dr. Henry Jackson. Three have been dropped by the Council for non-attendance and non-payment of dues. This leaves the Society with a membership of 134. One corresponding member and sixteen new active members are proposed. Of these, the proposal for corresponding membership and nine for active membership have been approved by the Council. The Society is limited to 150 active members.

The TRANSACTIONS for the past year have been printed and issued. The delay which is involved by publication in London, and the fact that fewer of our papers than usual have been utilized by the *Journal of Balneology and Climatology*, and the fact that for the first time duty was collected on the sheets, entirely contrary to the experience in past years, makes it desirable to print the next volume at home, and the Council has so voted.

Financial Statement.

Receipts:		
Balance, May 12, 1903	$ 21 67	
Received from dues	1014 00	
From other sources	25 76	
Total		$1061 43
Expenditures:		
Paid for printing	$774 50	
To stenographer, etc.	40 20	
To Custom House	54 40	
To lantern	7 50	
To other expenses	165 24	
Total		1041 84
Balance, June 1, 1904 . . .		$19 59

The TRANSACTIONS of the Society have been sent to nearly one hundred libraries and journals in this country and abroad, and all copies for foreign addresses are sent through the Bureau of International Exchanges of the Smithsonian Institution. This entails considerable expense, but it is fully warranted by the high appreciation of our publications. The Society has received invitations from Aiken, Cincinnati, and Colorado Springs for the meeting in 1905. The American Academy of Medicine has invited our members to attend the sessions of the Academy at Atlantic City on June 6th.

We should also take note of the formation of the National Association for the Study and Prevention of Tuberculosis, to be organized at Atlantic City on June 6th, and lend whatever aid we can in the formation of a society which will occupy a field so closely allied with our own.

Acknowledgment is made of the following publications received:

Medicine, Chicago.
Chicago Clinic and Pure Water Journal.
International Medical Magazine, New York.
New York State Journal of Medicine.
Archives of the American Academy of Medicine.
Colorado Medical Journal.

Experiment Station Record, Washington.
Index Catalogue, S. G. O., Washington.
Public Health Reports, Washington.
Pennsylvania and New Mexico Weather Service Reports.
Tuberculosis, London.
Bulletin of the Royal Academy of Medicine, Belgium.
Bulletin of the Royal Academy of Belgium.
Journal of the Balneological and Climatological Society, London.

It was then moved and seconded that the Treasurer's report be received and referred to the Auditing Committee.

The Secretary then read the report of the Council on recommendations for membership. The Council recommended one name for corresponding membership, and of the sixteen applicants for active membership nine were recommended for election at the present meeting. The Council deems it proper to hold some names over until a subsequent meeting. After ballots had been cast, the following were announced as having been elected: To corresponding membership: Dr. Fleming Mant Sandwith, of London and Cairo. To active membership: Dr. Herbert Maxon King, of Liberty, N. Y.; Dr. Wilbur T. Little, of Cañon City, Col.; Dr. Henry Barton Jacobs, of Baltimore; Dr. J. H. Lowman, of Cleveland; Dr. William H. Prioleau, of Asheville; Dr. A. J. Richer, of Montreal; Dr. A. K. Stone, of Boston, and Dr. John A. Wilder, of Denver.

The Auditing Committee reported that they had examined the Treasurer's books and found the accounts correct. The committee's report was accepted and the committee discharged.

The Nominating Committee reported the following recommendations for officers for the ensuing year: For President, Dr. W. F. R. Phillips, of Washington; for Vice-Presidents, Dr. S. G. Bonney, of Denver, and Dr. S. D. Risley, of Philadelphia; for Secretary and Treasurer, Dr. Guy Hinsdale, of Hot Springs, Va.; for Representative to the Executive Committee of the Congress of American Physicians and Surgeons, Dr. F. I. Knight, of Boston; Alternate, Dr. R. G. Curtin, of Philadelphia; Member of the Council, to serve five years, Dr. J. C. Wilson, of Philadelphia. On motion, the report was received and the Secretary was directed to cast a ballot for the officers as designated by the committee, and they were, thereupon, declared duly elected.

The Nominating Committee suggested the following as desirable places for the next annual meeting, viz.: Colorado Springs, Mackinac Island, Augusta, and Aiken. The President said that it was for the Association to determine the subject at the present time, or to make some arrangement by which the incoming Council can determine the question as to which of these localities or what other locality shall be selected.

Dr. Edson said that many come long distances across the continent and desired to attend the meetings of the American Medical Association. He moved that the choice be left to the determination of the Council by ballot after the decision of the American Medical Association as to its meeting-place next year. Motion seconded.

Dr. McGahan said that rather than trust to a ballot it is better to leave it entirely to the Council or else decide before adjournment. He was in favor of leaving it to the Council.

Dr. Edson accepted the amendment. Dr. Cobb referred to Mackinac as a suitable place in July. Dr. Cobb amended the resolution providing that the vote be taken by mail. Dr. Marvel seconded the amendment, and stated that the American Medical Association would probably meet on the Pacific coast in 1905. Dr. Edson's motion was put to vote and carried, and the President announced that the subject was referred to the Council for decision.

Under Miscellaneous Business Dr. Jacobi said: I have been directed by the Council to bring something before you that you ought to decide. I hold in my hand twelve closely printed pages that contain a great many courtesies and some suggestions. What I refer to is a communication received by Dr. Keen, president of the American Congress of Physicians and Surgeons, from Dr. Reynolds, a representative of the Gynecological Association; then there is another letter directed to Dr. Wilson, the president of this Association. From the letter of Dr. Reynolds I read as follows (reads and comments). I am, therefore, now directed to move as follows:

The American Climatological Association expresses the opinion that in the organization of the Congress of American Physicians and Surgeons no change should be made unless it can be demonstrated to be an improvement.

That the establishment of any sort of political programme, for itself or in connection with other bodies, is detrimental.

That the idea of the Peppers, Da Costas, Drapers, and other

founders of the Congress, who meant to stop the narrowness of over-specialization and decentralization in the medical profession, should be lived up to.

That the Executive Committee of the Congress as now constituted has ample powers and facilities to organize each Congress, and no cumbersome increase of its members is desirable.

That the previous endeavors of the Executive Committee to facilitate the special work of the individual societies and associations, and, as far as possible, to restrict the time occupied by the Congress at large, be hereby approved; but

That the delegate of the American Climatological Association be instructed not to lose sight of the fundamental ideas underlying the formation of the Congress; and, finally,

That otherwise the whole matter be referred to him, to be decided in the next meetings of the Executive Committee, according to his discretion and wisdom.

Dr. Jacobi's motion was considered as a whole and unanimously carried.

The instructions of the Association were duly conveyed to the Representative on the Executive Committee.

Dr. H. S. Anders said: As a personal friend of the late Dr. Pearce, I would like to move that the Secretary be requested to express the sense of sorrow and loss in the death of Dr. Pearce in a written communication, to be forwarded to the doctor's family.

Dr. Fisk: I think the idea was very well expressed in the words of our President. I would move, as an amendment, that the Secretary be instructed to file a copy of that portion of the President's Address to the memory of Dr. Pearce.

The amendment was accepted, and the Secretary carried out the wishes of the Society.

The Society then adjourned.

Saturday, June 4th—Morning Session.

The Society was called to order at the Aldine Hotel, Philadelphia, at 10 a.m., Thomas D. Coleman, M.D., Vice-President, in the chair.

The first matter of business was the discussion of the report of the Committee on Nomenclature.

The Secretary stated that there was a copy printed in the minutes of the last meeting.

Dr. Quimby: I desire to say, as chairman of this committee, that in reply to the circulars sent out, I believe, by the Secretary last year, informing you of the resolution, the committee has received no suggestions whatsoever. There has been no reply and nothing said about it; and, therefore, there has been no further meeting of the committee, and the committee has no further report to make than to present this.

I desire to say personally again, what I said before, that in making this proposition it was not thought to perpetuate any definition of these terms which would be recognized as accurate. It was understood at the outset that the only thing which could be done was to come to some general agreement in order that our writing might be as nearly uniform as possible. It is understood that it cannot satisfy everybody, because it cannot satisfy the physician even, and the only purpose is to come as near as possible to something that may be satisfactory.

The President called for discussion.

Dr. Knight: Although my name appears on this report, I must say I hardly approve of it, and I think it is almost impossible for us to come to any common understanding at this time about it. You know also Dr. von Ruck has another proposition, which would involve a great deal of discussion. I must say that I feel as if the whole thing had better be indefinitely postponed. If anybody else feels the same way, I should make that suggestion.

Dr. Fisk: Cannot you accept the report and continue the committee?

Dr. Knight: I think the committee would decline to continue. If somebody else would move, who was not on the committee, that the report be received and the committee discharged, I would be glad, and I would make my other proposition.

Dr. von Ruck: I find that this classification, while it is anatomical and based upon physical science only, does not reflect a prognosis in pulmonary tuberculosis.

Dr. Knight: Mr. Chairman, would it not be proper to receive this report first?

Dr. Howard S. Anders: I move that the report be received.

Seconded by Dr. Klebs.

Dr. Quimby: I rise to a point of order. This report is received; nobody can be discussing the report without having received it. It is a fundamental principle in parliamentary law that any report which has been read has been received.

Dr. H. S. Anders: I move its adoption, in order that it may come up for discussion.

Dr. Klebs: I second it.

The President: It has been moved and seconded that the report be adopted. Is there any discussion?

Dr. Fisk: I move that the adoption of the report be laid on the table.

Dr. Otis: I second that motion.

The President: You have heard this amendment.

Dr. Minor: Before we vote on that—

Dr. Fisk: That is not debatable.

The President put the question, and the motion prevailed.

Dr. Minor: What I wished to inquire about was this: I did not rise to discuss the utility or inutility, but I think most of us would find differences. I have not found the classification satisfactory, but I regret to see that Dr. Knight seems to think the subject is too big for us to handle. I think everyone of us feels a great necessity of having a uniform classification that we could all go by. It is a big subject, I admit; but it seems to me this Climatological Association is the very one that has got to handle it, and until we do come to some uniformity, members corresponding with one another or writing articles for the scientific journals have no common basis to work upon. I would like to know whether Dr. Knight means whether he will drop i for good.

Dr. Knight: I do not mean to say that it will never be possible for the Association to adopt a classification; but, as I have sounded the sentiment of different members of the committee and of the Association, I think that the time has not come when we would be able to adopt a classification which would be satisfactory, even to the majority; and certainly we have not got time to do it to-day. I feel that this report is not altogether satisfactory, and I think that it would take more time than we can allow to consider the subject. I would be very glad to have another committee appointed, with Dr. Minor as chairman.

Dr. Minor: Many thanks! many thanks!

Dr. Knight: I think the present committee have done all that they could at the present time. The new American Tuberculosis Association will probably be called upon to issue a classification which would be recognized as authoritative by the profession.

Dr. Elliott: Is the question still open for discussion?

The President: No; it is closed, I think.

Dr. Fisk: What is the status of the question?

The President: Laid on the table.

Dr. Fisk: No; the adoption—the layer on the table—I particularly used the word "adoption." The Society does not commit itself to the classification that the committee has presented. It holds it in abeyance; that is all. I move you, sir, that the report be accepted and the committee continued.

The President: It is already disposed of.

Dr. Sewall: I move we proceed to the regular order of business.

The President at this point called upon Dr. von Ruck for the production of a paper on this subject, the title of which was not on the programme; whereupon Dr. von Ruck stated he thought it would be better to read the paper by title. The Association determined, on motion, that the paper should be read by title, and the matter was so recorded. (See page 272.)

Business Session.

Dr. Coleman, Vice-President, called the meeting to order and conducted the President-elect, Dr. Phillips, to the chair.

Dr. Phillips made a speech, and closed by saying that he sincerely and heartily thanked the Society for the honor conferred upon him.

The Secretary: I propose a vote of thanks to our retiring President, Dr. James C. Wilson, for his great efforts to promote the success of this meeting and the welfare of the Association.

Motion seconded and unanimously carried.

The Secretary: I would also propose a vote of thanks to the Board of Trustees of the University of Pennsylvania and to Dr. C. H. Frazier, the dean of the Medical Department, for the use of Houston Hall for our meetings of yesterday, and also for the entertainment which they provided at luncheon.

Motion seconded and carried.

The Secretary: Also a vote of thanks to Dr. Samuel D. Risley, chairman, and the Committee of Arrangements for their labors in arranging for the entertainment, both at Willow Grove and last night at the annual dinner, which passed off with great satisfaction.

Motion carried.

Dr. Curtin moved that we return our thanks to the proprietor of the hotel, who has been very kind to us.

Motion seconded and carried.

The Secretary suggested that there be an informal meeting of the Council at the close of this session, in order to determine when the Council wishes to convene again, with reference to the question of time and place for the succeeding meeting. That ought to be talked over a little before we adjourn as a body, and some arrangements be made for calling this Council together.

The President: Will not the members of this Council be present at Atlantic City, and, toward the close of the meeting, knowing when and where the American Medical Association shall meet, we could talk it over to better advantage.

The Secretary: We might talk it over next week. The Council is composed of the President and Vice-Presidents, the Secretary, Dr. J. C. Wilson, Dr. Jacobi, Dr. Bonney, Dr. Fisk, Dr. Bridge, Dr. Knight, and Dr. Curtin.

The President called on Dr. Curtin.

Dr. Curtin: It seems to me the sooner they get together the better, and if they have the data, I do not see why they could not act at once.

The President: A suggestion has been made that we might select our place of meeting with reference to the American Medical Association, so that we might do just as we have done this time. I suppose we can all get together at Atlantic City; most of the Council will be there.

Dr. Knight: I think it a good thing to sleep on it for six months.

Dr. Otis: I would like to propose a vote of thanks to our Secretary for his untiring devotion to the duties of this meeting.

Seconded by Dr. Solly, and carried.

The President: Last year at Washington we fixed the dues, as you will recall, at $7.50 for this year. I believe that action was simply for this year, was it not?

The Secretary: That was the resolution for this year.

The President: The question now comes up as to what shall be the dues; shall we continue that rate of dues, or shall we return to the original dues?

The Secretary: They ought to be continued for the coming year.

The President: I suggest that the Secretary make a statement.

The Secretary: Under the circumstances, I should say we should continue our dues at the same figure during the succeeding year. I do not see how we can very well recur. We have a large bill to meet in connection with the assessment of this last Congress, and we have

our TRANSACTIONS to publish again, and I think, with all these papers (there are thirty-three papers on the list), that we shall have a pretty large volume next year. Then there will be some illustrations. I took it upon myself to guarantee the expense of half the cost of some of those illustrations of Dr. Edson and Dr. Bergtold's article, by making a selection of them all. We always publish some illustrations, and there will be some tabular matter, and I think there will be a pretty large volume. I do not see how we can get along very well with less than the sum for the past year.

Dr. Edson: I move that the dues be left to the Council to increase, if necessary, to the same amount.

The Secretary: The Council is not likely to meet again for six months.

Dr. Minor: I would move that the dues for the coming year be retained at the same figure as the last year.

Motion seconded and carried.

The President: The dues will, therefore, remain $7.50 for the ensuing year. If there is nothing more to bring before the Society, a motion for adjournment is in order.

On motion, the meeting then adjourned.

GUY HINSDALE,
Secretary.

CONSTITUTION AND BY-LAWS.

CONSTITUTION.

Article I.—Name.

This Society shall be known as the American Climatological Association.

Article II.—Object.

The object of this Association shall be the study of *Climatology and Hydrology and of Diseases of the Respiratory and Circulatory Organs.*

Article III.—Membership.

Section 1.—This Association shall consist of *active, corresponding,* and *honorary* members, the former not to exceed one hundred and fifty, and the latter not to exceed ten.

Sec. 2.—Names of candidates for active membership, whose applications have been endorsed by *two* (2) active members, shall be sent to the Secretary at least thirty (30) days before the annual meeting. On approval of the Council, the applicant shall be balloted for at the annual meeting. Three (3) black balls shall be sufficient to reject a candidate. The Council shall have power to nominate active members.

Sec. 3.—The power of nominating honorary and corresponding members shall be vested in the Council. The election shall be conducted in the same manner as that for active members. Honorary members shall enjoy all the privileges of active members, but shall not be allowed to hold any office or cast any vote.

Sec. 4.—Any member of the Association absent from the meetings, in person or by contributed paper, for three (3) consecutive years, without sufficient cause, may be dropped from the list of members by vote of the Council.

Article IV.—Officers.

Section 1.—The officers of this Association shall consist of a *President,* two *Vice-Presidents,* a *Secretary and Treasurer,* who, with five other members and the delegate and alternate to the Executive Committee of the Congress of American Physicians and Surgeons, shall constitute the *Council* of the Association.

Sec. 2.—*Nominations.* The officers, including the Council, shall be nominated by a committee of five (5) members, which committee shall be nominated by the President at the first session of each annual meeting, and shall report at the business meeting.

Sec. 3.—*Elections.* The election of officers shall take place at the business meeting. A majority of votes cast shall constitute an election.

Sec. 4.—The President, Vice-Presidents, Secretary and Treasurer shall enter upon their duties at the close of the annual meeting at which they are elected, and shall hold office until the close of the next annual meeting, or until their successors are elected.

Sec. 5.—Members of the Council, other than the President, Vice-Presidents, Secretary and Treasurer, shall hold office for five (5) years.

Sec. 6.—*Vacancies.* Any vacancy occurring among the officers of the Association during the year may be filled by the Council.

Article V.—Duties of Officers.

President and Vice-Presidents.

The President and Vice-Presidents shall discharge the duties usually devolving upon such offices. The President shall be *ex-officio* Chairman of the Council.

Secretary and Treasurer.

As Secretary, he shall attend and keep a record of all the meetings of the Association and of the Council, of which latter he shall be *ex-officio* Clerk. At each annual meeting he shall announce the names of all who have ceased to be members since the last report. He shall superintend the publication of the Transactions, under the direction of the Council. He shall notify candidates of their election to membership. He shall send a preliminary notification of the annual

meeting two (2) months previous thereto, and the programme for the annual meeting at least two (2) weeks previous to its assembly, to all the members of the Association. He shall also send notification of the meetings of the Council to the members thereof. At each annual meeting of the Association he shall read the minutes of the previous meeting and of all the meetings of the Council that have been held during the current year.

As Treasurer, he shall receive all moneys due, and pay all debts therewith. He shall render an account thereof at the annual meeting, at which time an auditing committee shall be appointed to report.

Article VI.—Council.

The Council shall meet as often as the interests of the Association may require.

Four (4) members shall constitute a quorum.

It shall have the management of the affairs of the Association, subject to the action of the Association at its annual meetings.

It shall consider the claims of candidates recommended to it for admission to membership.

It shall not have the power to make the Association liable for any debts exceeding in total one hundred dollars ($100), in the course of any one year, unless specially authorized by a vote of the Association.

It shall have the entire control of the publications of the Association, with the power to reject such papers or discussions as it may deem best.

It shall have power to nominate active members at the annual meeting.

The Council shall have power to invite any gentleman, not a member, to read a paper at the annual meeting, on any subject within the scope of the objects of this Association.

The Council shall determine questions by vote, or—if demanded—by ballot, the President having a casting vote.

The Council shall constitute a Board of Trial for all offences against the Constitution and By-Laws, or for unbecoming conduct, and shall have the sole power of moving the expulsion of any member.

The President, or any two members, may call a meeting, notice of which shall be transmitted to every member two (2) weeks previous to the meeting.

Article VII.—Papers.

Section 1.—The titles of all papers to be read at any annual meeting shall be forwarded to the Secretary not later than one (1) month before the first day of the meeting, in order to appear on the printed programmes.

Sec. 2.—No paper shall be read before the Association which has already been printed or been read before another body.

Article VIII.—Quorum.

A quorum for business purposes shall be ten (10) members.

Article IX.—Amendments.

This Constitution may be amended by a four-fifths ($\frac{4}{5}$) vote of all the members present at an annual meeting, provided that notice of the proposed amendment has been printed in the notification of the meeting at which the vote is to be taken.

BY-LAWS.

1. Meetings of the Association shall be held annually.

2. The time and place of the meetings shall be determined by the Council.

3. The dues of active members shall consist of an annual assessment not to exceed seven and a half dollars ($7.50). The initiation fee shall be ten dollars ($10). Members in arrears shall not be entitled to vote. Those in arrears for two (2) years may be dropped from membership by recommendation of the Council.

4. Order of business meeting.

First day:

Calling the roll of members;
Minutes of previous meeting;
Treasurer's report;
Appointment of auditing committee;
Appointment of nominating committee;
Report of Council on recommendations for membership.

Second day—Morning session:

Report of nominating committee;
Election of officers;
Election of members;
Report of the committee on health resorts;
Miscellaneous business;
Adjournment of business meeting.

Any of these By-Laws may be amended, repealed, or suspended by a two-thirds ($\frac{2}{3}$) vote of the members present at any meeting.

ADDRESS OF THE PRESIDENT.

By J. C. WILSON, M.D.,
PHILADELPHIA.

Members of the American Climatological Association,

Gentlemen: I owe it to myself to assure you that I highly appreciate the honor of having been chosen to preside over your deliberations at this the twenty-first annual meeting of the Association. We celebrate the attainment of our majority in a city which has a memorable place in the history of medicine in America, and which, in the friendly rivalry of the great centres of thought in our country, strives to maintain that place to-day.

You are thrice welcome here. Welcome as old friends; as fellow-workers in the effort to advance the cause of scientific medicine, and as envoys from distant fields of labor bringing gifts to that cause.

It may not be without interest to you to know that this city, at that time a comparatively small place, was the exclusive field of labor of the first American physician who, about a century ago, recognized the importance of climatology as a special branch of the science of medicine and gave it, among other matters, his particular attention. Other scientific men among the Colonists, both within the ranks of those engaged in the practice of medicine and outside that body, had from the earliest days recorded their observations upon the climatic conditions of the new world and the influences upon the health of the settlers arising from them, together with accounts of the diseases which they appeared to produce.

It remained, however, for Benjamin Rush, that most versatile and unwearied humanitarian, the first great American physician,

to enter upon the study of this branch of medicine in a spirit not only far in advance of his time, but which, in fact, would not have discredited medicine at any period. For this undertaking he was fully prepared by an excellent education, being a graduate of Princeton College, and having passed six years as a student in the office of Doctor Redman, two years in Edinburgh under the celebrated Cullen, and some months in medical work in London and Paris. He had not only an excellent education, but he was also a man of extraordinary ability. It is not, therefore, to be wondered at that he made the study of the climate with which he was familiar one of the specialties which occupied his attention. The first and most important of his publications upon subjects which would have engaged our attention was the address delivered before the American Philosophical Society, entitled "An Inquiry into the Natural History of Medicine among the Indians of North America, with a Comparative View of Their Diseases and Remedies with Those of Civilized Nations." This essay was delivered when Rush was only twenty-nine years of age, but it has been regarded as a sort of American classic, and as embodying at once most important points concerning the red men of that day, and valuable conclusions concerning the value of fresh air, cold water, and exercise in health and disease.

A second paper of great importance is that entitled "The Climate of Pennsylvania." Next in order are two essays on "Consumption." To this list must be added the paper on the "Epidemic of Yellow Fever in Philadelphia in 1793," and the papers which followed it, describing the various subsequent outbreaks of that disease which came under the observation of this remarkable physician.

It was not only in the early history of Philadelphia that the subjects which especially interest us received particular attention, but in all time they have occupied the attention of our physicians. Drake, whose chief claim to distinction rests upon his account of the diseases of the Mississippi Valley, was for a time, unfortunately too brief, a member of the faculty of one of our most important medical schools. More recently Philadelphia has taken the lead in climatological matters. For two years Captain

Kieffer, of the United States Army, has delivered courses in "Tropical Medicine" to the fourth-year students of the Jefferson College, the first systematic courses upon such subjects in our schools. More than a year ago the American Society for the Study of Tropical Diseases was founded here, and only a few weeks have elapsed since in this city was organized the National Association for the Study of Tuberculosis.

For many years our Rush Hospital for Consumptives has been doing a limited but most useful work, and quite recently, owing to the munificence of Henry Phipps, the Phipps Institute for the Study and Treatment of Tuberculous Diseases has been organized, under the management of Dr. Lawrence F. Flick.

It must be evident to you that, so far as that branch of medicine with which we are particularly concerned goes, I, who have the honor to address you, am, in the words of Saint Paul, a citizen of no mean city. Your presence here to-day adds to the significance and importance of Philadelphia in the movement to advance climatological science, both now and in the future.

My allusion to the two newly formed societies, of which I have spoken, brings up a question of vital importance to us. Are we to rest satisfied with the scope of our work as laid down in the past, or are we to enter into the great world agitations and enlarge the scope of our labors beyond the limits originally appointed and explicitly defined for us in the constitution as "papers upon climatology, hydrotherapy, and diseases of the respiratory and circulatory organs?" I, for one, believe that this clause in our constitution might well be carefully reconsidered. In politics I am no expansionist, but in regard to the limits of our work I am distinctly and earnestly in favor of expansion, not in the direction of internal medicine, but in that of our work as indicated by our title—climatology. I would have deemed it fortunate if we had increased our membership and the scope of our work by interesting all of those who have formed the two societies which I have mentioned in our organization, and making it plain to them that we are in the highest sense—a sense more extended than is generally understood—an Association which includes within its scope all that they include in theirs, and much more.

The multiplication of societies is a misfortune, and it is doubly a misfortune that any limitation of interest or scope should lead to the organization of new bodies doing the same work as those already in existence.

The subjects which come properly within the consideration of this Association appear to me to be as follows :

1. Climate generally considered.
2. The climates of particular regions and localities.
3. The etiological relation of climate to disease.
4. The therapeutic relation of climate to disease.
5. Incidentally, any disease or diseases to which climate bears a causal or curative relation.

I hold, therefore, that the whole subject of tropical diseases comes within the consideration of this Association, and that its usefulness would be much more extended if those who are interested in such diseases were to become members and contribute papers.

With reference to tuberculosis, the work of this organization has been of signal importance. It has had a large part; indeed, it was one of the initial forces in that world movement which started about the time of our organization, and aroused the Western world from its more than Oriental apathy in regard to pulmonary consumption, and has made the fear of it and the hope of deliverance from it motives of transcendent importance and power.

The TRANSACTIONS OF THE AMERICAN CLIMATOLOGICAL ASSOCIATION constitue an accurate historical record of that movement from its inception. They contain, also, among other matters of great value, the account of the growth and development of the sanatorium idea, and of the correlated subject of the dispensary scheme for the management of ambulatory cases, of which Dr. Otis gave such an admirable account at our last session.

Those of us who are no longer young see in all this a rapid but coherent and most reassuring evolution of the subject of the treatment of the tuberculous diseases which has gone hand-in-hand with the development of knowledge concerning causation and pathology. The crude and misleading notions formerly prevalent

concerning climate have given place to scientific estimates of its value and reasonableness in the selection of cases. For the majority of those who cannot avail themselves of climate therapy, a systematic institution treatment has developed, with results that are most encouraging. And at length we are in the way of systematizing the principles of home treatment. The most important part in all this advance is not that cases are now and then arrested and sometimes cured, but that the whole matter is a means of popular education upon an extended scale, and that plans which were instituted as a means of cure have become also a department of preventive medicine.

The student of history is impressed with the fact that particular diseases owe their prevalence at particular epochs to the mode of life of the period, and that with changed conditions they cease to prevail. The plague no longer ravages Europe; typhus fever has ceased to make history; leprosy is unknown in the British Isles. May we not look forward to the day when the great scourge of our time may be, at least, under sanitary control? It is a long look ahead—far beyond our time—but for us and for those who come after us there lies the goal toward which we are to strive.

A few days ago, when the programme for this meeting had already come into your hands, one of our members, Dr. F. Savary Pearce, ceased from his labors. The title of the paper he had prepared for us indicates his trend of thought in medicine. Deeply interested in the subject of diseases of the nervous system, he had already won success and reputation as a neurologist, and had just finished a treatise upon that branch of medicine. He was a man of gentle manners, serious minded, of great industry, and absorbed in his profession. His death, early in a career of great promise, deprives us of an active co-worker and our profession of a physician and teacher of conspicuous ability.

We are also called upon to mourn the loss of Dr. E. A. de Schweinitz, of Washington, an earnest member of our Association, whose devotion to laboratory work, especially in bacteriology, yielded results of great scientific and practical value. His

death was sudden and occurred under circumstances which gave rise to the fear on the part of some of his friends that it may have been due to some accidental virulent infection acquired in laboratory investigation—that his life was sacrificed to his scientific zeal. Dr. de Schweinitz was gifted with fine personal traits, and his death is a great loss to the profession which he adorned.

CLIMATOLOGY AS A STUDY IN THE MEDICAL SCHOOLS.

By S. E. SOLLY, M.D.,
COLORADO SPRINGS.

I DESIRE to call the attention of the Society to the question of the establishment of systematic teaching of climatology in the medical schools. In order to ascertain how far this was at present carried out, I mailed a circular to all the medical colleges I know of. It was addressed to the Dean or Secretary of the college, and was as follows:

DEAR SIR: As I desire to bring before the American Climatological Society at the next meeting the status of instruction in Climatology in the leading Medical Colleges of the country, I shall be very much obliged if you will kindly answer the following questions:

1. Is Climatology included in the regular curriculum?
2. Are a certain number of questions regularly set in the examinations and the answers rated?
3. If so, how many lectures are given; are they in a separate course or in connection with one or other subjects, and for which year's students?
4. What books are recommended to be used in the study of Climatology?

An early anwer will be much appreciated by

Yours very truly,

Thirty answers were received, of which seven stated that climatology was included in the curriculum, questions were set, and books were recommended. The rest of the colleges said there was no regular instruction, but that the different professors, sometimes the professor of medicine, sometimes of therapeutics, sometimes of diseases of the lungs, referred to the matter of climate in connection with the various diseases which they discussed.

It seems to me that, as a climatological society, we ought to seriously consider this matter. We, as practitioners who avail ourselves of the resources of change of climate in certain of our

cases, know only too well the sad consequences that often ensue from patients being sent to the wrong climates or under wrong conditions. Omitting the cases which are in the hands of venal doctors, who keep them at home until both their health and wealth are gone, and then turn them adrift, there are those who, while honestly endeavoring to do their duty, err through ignorance, and send a patient in the wrong direction, giving him the wrong impulse at first. This initial mistake is very seldom overcome, but the tragedy that follows, follows so long after that its connection with the primary blunder is lost sight of—the tragedy not only involves the life of the patient, but may cause the breaking up of families, breaking up of business, and various other misfortunes.

There may be a variety of reasons for the error in judgment on the part of the physician, perhaps he is not thoroughly acquainted with or fails to correctly diagnose the case; but what I am dealing with now is the matter of ignorance of the principles upon which to select a climate, in consequence of which the doctor is compelled to use the recommendations prompted by self-interest, such as statements by railroad and hotel companies and of certain unscrupulous or prejudiced health-resort doctors.

If this Society is going to be continued to be called the Climatological Society and to believe there is something in climate, it must teach the error of the belief that is now being so much advocated in connection with the open-air treatment of tuberculosis, which is that it is the quantity of air alone that is valuable, the quality of the air counting for nothing, whereas we know that both are valuable. While hygiene in the treatment of tuberculosis, as in that of most diseases, is of the first importance, and Burney Yeo's dictum, "Care without climate is better than climate without care," is undoubtedly true, yet over and above the necessary abundance of air the quality has to be reckoned with, else why should the widest cultured and most eminent practitioners believe in it, and why do so many doctors send patients to special climates. As this is done, let it be done properly, by teaching the students the principles for forming a correct judgment to discuss this subject. Teachers say, "We have not time; the unfortunate student is too overburdened"; but they all admit they talk about

climate, as they do so, why don't they talk in a systematic way; why don't they give at least three lectures in some definite course, preferably, I should think, to the third-year students in the course of therapeutics, giving them there the basis for judging and selecting a climate, and, to make it sure that they do attend to it, set them one or two questions in their examination papers. That is all I ask for this society to do, namely, to use its influence to put the teaching of climatology on a systematic and firm basis. We are all proud of being called climatologists, and we meet together in a jolly kind of way, but some seem to be half-ashamed of being real climatologists, and like to talk only of organs and drugs. These subjects, however, have their proper place in our deliberations. We have had many valuable papers on climate, and a great deal has been done, in spite of this tendency among some members, to advance climatic knowledge by this Society, and certainly in our TRANSACTIONS stand out many accurate and luminous studies of climate and its influences, and the volumes are invaluable contributions to medical literature.

However much we have accomplished, yet we are not doing our whole duty if we do not exert our influences to further the instruction of the rising generation of physicians.

DISCUSSION.

DR. CARROLL E. EDSON: In addition to the lack of time for more teaching in medical schools, which has been spoken of, there is another difficulty in the teaching of a subject like climatology in two or three lectures. Climatology, and particularly what is called medical climatology, is not an entity. Climate is not an entity. Its remedial action is not a definite process, and its therapeutic selection and application cannot be taught as can that of a drug like digitalis in a didactic lecture or in the pharmacological laboratory. Climate for a patient is but the collocation of conditions which may surround him—of sun and wind and heat and moisture, etc.—which may make more or less easy for him the proper mode of living, and subject him to the least physiological tax. The proper selection of health resorts is an impossibility, even after reading climatological literature, if the physician does not understand the interpretation of the underlying principles which make up the details of

weather and its larger study of average weather known as climate. The elementary principles, the foundations on which such therapeutic application must rest, are those of meteorology. Medical students do not know—most general practitioners do not know—how to read even ordinary meteorological data so as to obtain any real picture from the tables. They would be put to it to explain what the dew point is and why. Medical students, the future general practitioners, should be taught first these essentials, or directed where they can learn these principles in some simple text-book, and time thus spent would go far to help them read correctly the meteorological statistics which are at the foundation of any description of relative climates. It would do much to keep them from reading or believing all the atrocious statements put into hotel, railroad, or even some medical publications concerning health resorts.

Dr. N. S. Davis, Jr.: The difficulty in introducing climatology as a required part of the curriculum in medical schools has been referred to; it is want of time. There is just as much demand, just as much need of a full course in dietetics, a full course in electrotherapeutics, and a variety of other subjects, as there is of climatology; and yet, as special topics, these have to be neglected or brought in incidentally. To-day all of the good medical schools are crowding five years' work into four years of time; students are overwhelmed with work, and the curriculum is overcrowded. Under these circumstances it is absolutely impossible to require attendance upon systematic courses in these subjects; furthermore, the methods of teaching have changed very considerably. Pharmacology is to-day taught largely as a laboratory and comparatively little as a lecture course. The result, I think, is that few lectures are given on general subjects like climatology and dietetics, except as they are given incidentally in connection with clinics and in connection with didactic teaching in practice.

As regards my own custom and that of Northeastern University, which I represent, I devote almost without exception at least two lectures a year—sometimes three—to the subject of climatology; but usually I have a tubercular patient before me as an excuse for giving the lectures. In two lectures I can cover the fundamental principles of climatology and point out the combination of conditions which characterize various typical climates; then I repeat the indications for choice of climate over and over again. Not only I but my colleagues who are talking about climatology as applied to individual cases and diseases do this. In this way the subject is taught, and is pretty thoroughly taught.

Dr. Solly has referred to the fact that so many patients go for climatic treatment to climates that they ought not to go to, through ignorance. That is by no means always the fault of the physician who formerly treated them; indeed,

I think very frequently, perhaps, in a large proportion of cases it is not his fault. Patients very frequently insist on going where they are not advised to go, or they make their own choice, or, as very often happens, they do not go when climatic treatment is ordered for them, but put off such treatment until the very last, and take it as a *dernier ressort*—all of which we know they should not do; but these are patients we cannot govern.

Dr. E. O. Otis: The chair which I hold in Tufts Medical School is that of "pulmonary diseases and climatology," but I must confess that I find but little time to give instruction in the latter subject. In a four years' course the students are so overwhelmed with work in their regular courses of study that but scant time remains for any subjects which in comparison may be called incidental or accessory. In my experience I find that practically whatever of the elements of climatology I am enabled to teach I have to bring in in a fragmentary way in connection with the general subject of pulmonary diseases. I think it would be difficult for me to find time for even three lectures solely devoted to the subject of climatology. I think that the subject should be taught with care, and that more time should be devoted to it; possibly a solution of the problem would be to make the subject elective, as some other subjects are now taught, I understand, in the Harvard Medical School, and, I dare say, in medical schools elsewhere.

I should like to ask Dr. Solly exactly how much time he thinks should be devoted to the teaching of medical climatology, and how best the subject should be presented. Should it be in a course on therapeutics or clinical medicine, and at what stage of the student's career should it be taken up?

Dr. A. Jacobi: I simply want to draw the conclusion of what Dr. Edson has been saying. The science of therapeutics is an applied science. It is applied in this, that whoever has not learned any physics in meteorology and physiology cannot understand it—no one, no matter how big his laboratory is nor how many books he has been reading; therefore, the preparatory knowledge should be conveyed—physics and physiology; and if that be so, it is not necessary to spend very many lectures in a didactic course on climatotherapeutics.

Dr. Charles L. Minor: While I never like to speak against the extension of the curricula of our colleges, it seems to me as long as the time available is as short as it is, and the subjects which we now teach as important as they are, we will have to realize that the ideal of teaching the student before he leaves the medical college something of every subject in medicine is too high a one for us as yet. Climatology and, as Dr. Davis says, dietetics and other branches are more important; yet we have to realize that in four years' time a man is doing better to get a thorough working knowledge of fundamentals, and will have to learn for himself afterward, if he has the proper

ambition and proper insight, what the other branches are, those after a few years which he cannot be ignorant of and which he cannot expect of the medical schools to give him training in. If we would bring in all the related branches of medicine, of which there are so many, eight years would not be enough to turn a man out with full knowledge of all these topics. I thought, if other agencies did so in teaching pulmonary diseases, wise to give students as full a knowledge as possible of climatology as we understand it to-day. Further than that it seems to be impossible to go; and for us to pass any resolution or anything of the sort asking that our specialty should be taken under the working or wing of these colleges would, therefore, be entirely impracticable. We have got to trust to the enthusiasm and the interest of the man after he leaves college for securing a knowledge of that branch of medicine.

Dr. Guy Hinsdale: Dr. William Pepper, who was the provost of the University of Pennsylvania and one of the presidents of this Association, was one of the first to realize the importance of teaching climatology in the medical schools, and about ten or twelve years ago I was appointed the lecturer on medical climatology in what is known as the spring course, or the auxiliary course of medicine in this university. That course occupied a period of time just after the usual commencement, in what is known as the auxiliary course in medicine. I delivered for a number of years a course of ten lectures, beginning with two to three lectures on the general principles of meteorology, and the balance of the course was devoted to the general considerations of climate with reference, toward the end, to certain health resorts, mineral springs, and so on, in this country. (To the question interposed by a member as to whether such course was obligatory or elective, Dr. Hinsdale proceeded): The lectures were elective. The course was very well attended, and I think very much appreciated; but in the course of time, when the course in medicine was reorganized and the commencement was advanced to June, it became necessary to throw out what is known as the auxiliary course in medicine, so that after about five or six years I was not called upon to deliver those lectures. At present, therefore, there are no lectures delivered in this medical school on the subject of medical climatology; but I am quite sure that the course was a great advantage to the medical students. I think Dr. Solly has done very good service in calling attention to the need of it.

Dr. Solly: About the objections to my suggestion that climatology should be included in the regular curriculum: Concerning the question of time, of course if the lectures were taken out of one chair entirely, as Dr. Otis spoke of, if one professor could not afford to give all the time needed, doubtless others could contribute some of their time.

About the details, I believe that three lectures on climatology would do a great deal of good if one or two questions were set in the examination paper.

What Dr. Jacobi said is very true, that medical climatology is an applied science, and if men are lacking in a general knowledge of meteorology and physics it is going to be very hard to teach them anything about it; but, as I understand it, the general course of education in the high schools includes a fair amount of physics, and this it certainly ought to, especially with those who are seeking to become physicians.

I fully recognize that there are several subjects that are not generally included in the curriculum, such as dietetics, of which Dr. Davis spoke, that are perhaps of even greater importance. What I am asking for of the teachers is not to increase the burden laid upon the medical students, but to do little more than to incorporate their climatological instructions in one set of lectures, and to give them a little more definitely, and for the professor himself to take the subject more seriously than he does at present. Of course, in lectures on medicine, where you study the use of climate, it is necessary and proper that the application of climate to special diseases should be mentioned, but the reasons for choosing the climate and what climate means might be very well left to some professor, such as the professor of therapeutics; he, it seems to me, ought to be the man, and he ought to be allowed to give three lectures on that subject, and if his course is not long enough in itself I would take one or two lectures from some of the others.

The happy-go-lucky way at present in vogue in most schools is shameful. Of course, there are many men—Dr. Otis and Dr. Davis are both notable instances—who do their duty in this regard. I do not mean to say that it is altogether neglected, but it is not recognized as it should be. An elective course, such as Dr. Hinsdale suggests, is a very good thing, and these have been given at different places in the country at different times as post-graduate courses.

THE CLIMATE OF SANTA BARBARA, CALIFORNIA.

By WILLIAM H. FLINT, M.D.,
SANTA BARBARA, CAL.

It is my purpose to embody in this paper the results of my own observations at Santa Barbara during a residence of nine years, together with such statistical evidence concerning the climate as has been collected, during the last twenty-five years, by competent local scientific observers.

I beg leave, in the first place, to call your attention to certain facts concerning the geography and the topography of Santa Barbara, because of their important bearing on the meteorological conditions prevailing there.

The county of Santa Barbara comprises a tract of about 2450 square miles, situated upon the western coast of California and traversed by the thirty-fifth parallel of latitude. The form of the county is that of a parallelogram. Its breadth is 35 and its length 70 miles. Besides this tract on the mainland, the county embraces two of the four channel islands, viz., Santa Rosa and Santa Cruz, which are situated about 30 miles from the mainland and whose area is about 180 square miles. The two other channel islands, Anacapa and San Miguel, do not belong to the county. One side of the parallelogram looks westward and one side southward, both being washed by the Pacific Ocean; the other sides look, respectively, to the north and to the east. At Point Concepcion, the most southerly point of the western boundary, the coast line turns abruptly to the east and pursues that direction for 70 miles—*i. e.*, for the entire length of Santa Barbara county.

The county is divided into two parts, from a climatological point of view, viz., that north of the Santa Ynez Mountains and

that south of this range. The climate of the northern section is cool in winter, during which season frosts occasionally occur, and warm in summer, because this section is visited by the hot desert winds, and deprived of the tempering influence of the south winds through the interposition of the Santa Ynez range. The climate is dry at all times, for the same reasons, except on the coast, where the cold northwest winds exert their full force. It is, however, the southern part of the county of which one speaks when describing the climate of Santa Barbara, because this narrow strip of land presents topographical conditions peculiar to itself which have given it a wide reputation for the warmth and equability of its climate.

The first of these conditions is the direction of the southern coast line, which runs almost due east and west, as already stated, thus bestowing the advantage of a southern exposure upon the meridional littoral.

Another point, in the physical geography of this region, deserving emphasis is the fact that it is protected from the cold north winds by comparatively high mountain ranges—the Santa Ynez and the San Rafael—which reach an elevation of 3000 to 4000 feet.

Other important facts influencing the character of the climate are the prevalence of the ocean winds, which modify both the heat of summer and the chill of winter, and the southern latitude, which ensures a generous supply of warmth at all seasons of the year.

The soil of Santa Barbara is largely composed of clayey loam and is generally very dry, as it sheds the rain water easily and packs readily, thus diminishing evaporation from the earth and, consequently, the humidity of the air. The proximity of the Mojave and of the Colorado deserts also exert a powerful influence upon the climate of Santa Barbara in the following manner: The desert air, becoming greatly overheated during the daytime, rises to a considerable altitude and flows westward, above the mountain ranges, toward the sea. It follows this course because a like column of superheated air is rising over the adjoining deserts of Arizona and prevents it from moving eastward. The

vacuum formed by the ascent of the desert air is filled by cool air flowing eastward, from the ocean, over the coast regions, up the mountain sides and down into the arid plains of the Colorado.

This is the origin of the diurnal sea breeze which tempers the mid-day heat of Santa Barbara, bearing away to the desert the lower atmospheric strata, heated by contact with the warm earth.

Soon after sunset, the desert sands are rapidly cooled by the radiation of their heat. In consequence, the desert air is condensed and descends toward the earth. At the same time, the air in contact with the mountain tops cools more rapidly than that of the coast lands, at their base, and, sinking, flows westward over Santa Barbara and out to sea, producing the sudden fall of temperature, soon after sundown, which is recognized by all observers and against which newcomers are particularly warned. This land breeze may last far into the night and, cooling the air over the ocean, precipitates, as fog, particularly in spring and summer, the moisture held in suspension in the ocean air.

The belated pedestrian, walking homeward after midnight, often finds, however, that an equilibrium has been established between the atmospheric currents, that a perfect calm prevails and that the temperature has risen several degrees since the decline which follows sundown. On the other hand, the nocturnal land breeze may last until sunrise, to be gradually replaced by the diurnal sea breeze.

I ought, finally, to make mention of the influence of the Black Japan current, of the Pacific, in imparting warmth and equability to the climate of Santa Barbara.

The city of Santa Barbara, a town of 8000 inhabitants, founded in 1782 by Mexican Franciscans, under Father Junipera Serra, is situated in north latitude, 34°, 24′, 30.7″, and in west longitude, 119°, 41′, 22″, on the Santa Barbara channel, which is formed by the four channel islands already named. The city lies in a valley from one to three miles wide, at the foot of the Santa Ynez Mountains, which rise, on the north of the town, to an altitude of from 3000 to 4000 feet, on an inclined plane, which has an area of about 3000 acres or a maximum alti-

tude of 200 feet. This inclined plane is bounded, on the north, by the foothills of the Santa Ynez range and on the south and southwest by a table-land, or *mesa*, about 400 feet high, which is interposed between the channel, and the town, and, on the southeast, by the waters of the channel. Between the city and the Santa Ynez Mountains, lies the foothill region, which varies in breadth from one to three miles, and is, at different points, from one to five miles distant from the shore of the channel. The foothill region varies in altitude from 300 to 1000 feet, and embraces many hills, with intervening cañons and benches sloping southward, to the Santa Barbara valley. Directly north of the foothills, and almost in contact with them, rise the Santa Ynez Mountains, protecting them from the cold north winds. To the south, the foothills lie open to the channel, commanding fine views of the city, the *mesa*, the channel, and the distant islands.

Mission Cañon, one of the most noted of the foothills cañons, runs from near the old mission, with sinuous deviations, between picturesque hills and benches, northward and upward to the mountains. At the head of this cañon, 1000 feet above sea level and two miles from the city limits, is *Pine Crest*, where Dr. C. M. Richter has, for some years, made careful records concerning the climate of the highest foothill region. The beautiful Montecito valley, about five miles long and from two to three miles wide, lies to the east of the city of Santa Barbara. Its southerly portion is the analogue, so far as its climatic features are concerned, to the city of Santa Barbara and its foothills to those of Santa Barbara proper.

I shall now consider, *seriatim*, the elemental features of the Santa Barbara climate, viz. :

1. Sunshine.
2. Rain and fog.
3. Temperature.
4. Humidity.
5. Wind.
6. Purity of the atmosphere, embodying in my paper, as vouchers for my statements, a number of meteorological tables.

TABLE I.—Averages of Temperature (Degrees Fahr.), Rainfall, Relative Humidity, and Wind Movement at Santa Barbara, Cal., during the past twenty-five years (ending 1902).

Month.	Average of highest temperature.	Average of lowest temperature.	Mean temperature.	Relative humidity per cent.	Average rainfall.	Average hourly movement of wind.
January . . .	74.8	37.1	53.5	67	3.73	3.5
February . . .	78.2	36.1	54.8	69	3.21	4.0
March	79.8	38.3	55.7	70	2.28	4.5
April	82.0	40.8	58.0	71	1.18	4.6
May	82.2	44.5	59.3	73	0.36	4.5
June	85.4	47.9	62.5	74	0.10	5.0
July	86.7	52.3	65.2	76	0.02	4.2
August	87.0	53.5	66.7	75	0.00	4.0
September . .	88.2	50.5	66.0	75	0.22	3.6
October . . .	87.9	47.3	62.6	72	0.73	3.5
November . .	84.0	43.2	60.0	66	1.54	3.1
December . . .	77.1	38.6	55.7	65	3.63	3.5
Means . .	82.7	41.1	60.0	71	17.00	4.0

The first table was published by C. M. Gidney, Esq., Secretary of the Santa Barbara Chamber of Commerce, in an article on the climate of Santa Barbara, in the *Santa Barbara Press* of June 15, 1902, and was chiefly based upon the published statistics of the late Hugh D. Vail, Esq., of Santa Barbara, covering a period of twenty-five years. Mr. Vail's observations were made in the city of Santa Barbara, about one mile from the sea, at an elevation of about 130 feet above tide-water, the instrument-shelter being placed about 20 feet above the ground.

TABLE II.—Average number of Clear, Fair, Cloudy, and Rainy Days at Pine Crest and Santa Barbara, from August 1, 1897, to May 1, 1902.

Month.	Clear.		Fair.		Cloudy.		Rainy.	
	Pine Crest.	Santa Barbara.	Pine Crest.	Santa Barbara.	Pine Crest.	Santa Barbara.	Pine Crest.	Santa Barbara.
January . . .	16	17	8	6	7	8	4	$4\frac{1}{5}$
February . .	16	17	5	5	7	6	$3\frac{3}{5}$	$4\frac{2}{5}$
March	18	19	8	7	5	5	$4\frac{3}{5}$	$3\frac{4}{5}$
April	16	16	8	7	6	7	$3\frac{2}{5}$	$2\frac{2}{5}$
May	16	18	8	6	...	...	2	$2\frac{1}{5}$
June	21	16	7	9	2	5	$\frac{3}{5}$	$\frac{3}{5}$
July	27	19	4	11	0	1	1	$\frac{2}{5}$
August . . .	26	19	3	9	2	3	$\frac{1}{5}$	$\frac{1}{5}$
September . .	22	18	4	9	4	3	$\frac{4}{5}$	$1\frac{3}{5}$
October . . .	20	17	7	9	4	5	$3\frac{1}{5}$	$2\frac{3}{5}$
November . .	21	19	6	6	3	5	$2\frac{2}{5}$	$2\frac{3}{5}$
December . .	22	22	6	6	3	3	1	$1\frac{3}{5}$
Year . . .	241	217	74	90	50	58	28	32

The second table is borrowed from an article entitled "A Comparative Study of the Climate of Santa Barbara," published by Dr. C. M. Richter, of San Francisco, in the *Santa Barbara Press*, June 15, 1902, and is based on observations extending from August 1, 1897, to May 1, 1902. These tables show the average number of clear, fair, cloudy, and rainy days at Pine Crest and at Santa Barbara, for a period of five years. Not having time to read the tables, I shall give you the average mean results, under their appropriate headings, in dealing with the elemental climatic conditions.

Taking up the climatic elements, *sunshine* and *rain*, we find, according to Dr. Richter, an average annual record of 217 clear days at Santa Barbara, of 241 clear days at Pine Crest, of 32 rainy days at Santa Barbara, and of 28 rainy days at Pine Crest. These figures agree very closely with those of Mr. Gidney, published in the report of the Santa Barbara Chamber of Commerce in 1901, page 13, who estimates the average annual number of absolutely clear days during a period of fifteen years at 241, of fair days at 56, of cloudy days at 68, and of rainy days at 32. These figures are reproduced in Table 13 of Dr. Richter's paper, entitled "The Climate of Santa Barbara and Its Foothill Region," read at the thirty-third annual meeting of the California State Medical Society at Santa Barbara, April 21–23, 1903, and Dr. Richter there adds the Pine Crest record of fair days, viz., 77, and of cloudy days, viz., 68. The cloudy and rainy days occur almost exclusively in the winter and spring months, beginning generally, as will be seen in the tables, in November and December and recurring, irregularly, until April or May. Cloudy and rainy days are apt to be preceded by two or three very sunny, warm days which produce more than the usual evaporation of sea water. If the temperature then declines, the conditions are favorable for the production of clouds or of rain. A fairly reliable sign of rain is a very strong southeast wind. The heaviest and longest rains are generally preceded by such a wind which blows, uninterruptedly, for several hours before and during the rain. It commonly rains most heavily at night and clears in the early morning. The rain usually lasts

only one day or two days, rarely three days or more, and these rainy days may be succeeded by weeks or even by months of absolutely clear and cloudless weather. Occasionally there are slight rains in September or in October, but sometimes, as in the present years, 1903–1904, no rain fell, excepting trifling showers, until February. The average annual rainfall is shown by the first table to be seventeen inches. Thunder showers are very rare, occurring, perhaps, once in two or three years.

High fogs occur frequently from May until October, but are comparatively rare during the other months of the year. They creep in from the sea in the late afternoon, in the evening, or in the early morning, disappearing at an uncertain hour the following forenoon. Occasionally the fogs will persist all day and for a number of days consecutively. The writer witnessed a foggy period lasting continuously for seventeen days, in May and June, 1903. The fogs, being high, do not cause the deposit of so much moisture as one would expect from an eastern fog or "sea-turn."

Dr. Richter says (*The Climate of Santa Barbara and Its Foothill Region*, 1903): "The ocean fog is common on the Pacific coast in summer time and rather rare in winter time. At Pine Crest (a five years' average) one may expect fog on three or four mornings, for one hour or longer, every winter and spring month, and every second or third day every summer and fall month. Before 9 A.M., during summer and fall, the fog is generally dispelled. For Southern California the existence of fog means just what it may be proud of, namely, a cool summer temperature, sufficiently cool to make the existence of fog possible."

The mere statistical fact that there are, on the average, 32 rainy days annually at Santa Barbara and 28 at Pine Crest, might lead one to suppose that these days are rainy throughout. Such is, however, not the case, as the rain falls during a part of some of these days only. It is the writer's experience that there are scarcely 12 entirely rainy days in the year, at Santa Barbara, during which the health-seeker would be obliged to remain at home if he were unwilling to incur the slightest exposure. It will thus be seen that an invalid could safely spend about 250 entire days annually in the open air, without running the risk

of a wetting. Sometimes, the rain descends in tropical torrents, but generally it falls gently, so that, being gradually absorbed by the earth, it does not go to waste.

Temperature tables are of limited utility in conveying information concerning the actual sensible warmth or cold of a climate, but they are necessary parts of a systematic record, and you will find in Table I. the average highest, lowest, and mean temperatures, for each month in the year, at Santa Barbara and at Pine Crest. I need only call your attention to the mean highest temperature, 82.7°, the mean lowest temperature, 44.1°, and the mean annual temperature, 60.0°, at Santa Barbara, based on trustworthy observations extending over twenty-five years. These data convey an impression of notable uniformity of temperature, and this impression is amply confirmed by the experience of the all-the-year-around resident of Santa Barbara. In Dr. Edward O. Otis' exact and comprehensive paper on "Southern California," in *Wood's Reference Handbook of the Medical Sciences*, 1901, vol. ii. p. 554, he gives a table of climatic data for Santa Barbara, a part of which I reproduce in order to further prove the uniformity of temperature above referred to.

TABLE III.—Santa Barbara, latitude 34° 28′, longitude 119° 41′.

Temperature.	January.	April.	July.	Nov.	Winter.	Year.
Average or normal	51.2°	60.5°	66.8°	56°	54.01°	60.7°
Average daily range . . .	18	18	19	25	.....	19.1
Mean of warmest	57.8	65	69.2	62.3		
Mean of coldest	42.8	52	69.7	53		
Highest or maximum . . .	83	86	89	82		
Lowest or minimum . . .	38	41	44	40		

This table gives the mean yearly temperature as 60.7°, which is $\frac{7}{10}$° warmer than the average given in the table for Santa Barbara City, published by the Chamber of Commerce.

On the other hand, the average daily range is stated by Dr. Otis to be 19.1°, while the difference between the monthly means of January and July is but 15°. According to the estimates of Mr. Gidney (in the *Report of the Santa Barbara Chamber of Commerce* 1901, p. 12) there are, on the average, but three days

during the year when the maximum temperature reaches 90°, and only fifteen days when the mercury falls below 40°. During the last fifteen years, the temperature of 100° has only been attained on two days, and on both occasions this great heat was due to neighboring forest fires. The lowest temperatures ever recorded were as follows: one day, in 1888, 28½°; one day, in 1899, 29°; one day, in 1897, 32°. All these temperatures were taken before sunrise, but by noon on these days the temperature had risen from 20 to 30 degrees.

TABLE IV.

	Absolute minimum.	Absolute maximum.	Mean minimum temperature.					Mean maximum temperature.							
			Nov.	Dec.	Jan.	Feb.	Mar.	June.	July.	Aug.	Sept.	Oct.	Dec.	Jan.	Feb.
Santa Barbara . . .	28.5	107	49	46	44	45	47	73	74	75	75	72	66	63	65
Pine Crest	31	101	55	52	49	50	50	74	79	79	78	73	67	62	66

In order to show the difference in temperature between Santa Barbara and the foothill region, I here introduce a table, No. IV., borrowed from Dr. Richter's *Climate of Santa Barbara and Its Foothill Region*, from which it will be seen that the mean minimum temperature is from 3° to 6° lower at Santa Barbara than at Pine Crest, while the mean maximum temperature is for almost all the months from 1° to 5° higher at Pine Crest than at Santa Barbara. The relation is reversed in only one month, viz., January, when the mean maximum at Pine Crest is 62°, 1° lower than at Santa Barbara.

"Sensible temperature," as it is called, chiefly depends on the combined effects of temperature, wind, and moisture. Cool days seem less so if there is but little wind, with a low relative humidity, and hot days are more easily tolerated in the absence of great moisture or high winds. Now, these are the conditions obtaining throughout the year at Santa Barbara, and the result is that there are very few uncomfortably hot or cold days at that place. One can generally count these uncomfortable days on the fingers of one hand. Dr. Richter says (*Climate of Santa Bar-*

bara, etc.) : "Santa Barbara has an average of three days with a temperature of 80° or above in July, six in August, five in September, four in October, and three in November; but on only three days in the year the temperature may reach 90° or above."

The average summer day is warm, but not hot, and the night so cool that the sleeper needs a blanket, and sometimes two blankets, in the hours preceding the dawn.

The winter days are usually clear, calm, sunny, and agreeably warm. There is no frost severe enough to destroy lemons, roses, violets, or heliotrope, and no snow, except an occasional narrow band along the mountain tops.

TABLE V.

	Winter.		Spring.		Summer.		Fall.	
	Relative humidity	Wind, miles per hour.	Relative humidity	Wind, miles per hour.	Relative humidity	Wind, miles per hour.	Relative humidity	Wind, miles per hour.
Santa Barbara .	67 %	3.6	71 %	4.5	75 %	4.2	71 %	3.4
Pine Crest. . .	55	4.6	66	4.4	69	2.6	61	3.7

Coming, now, to a consideration of the humidity and of the winds at Santa Barbara, I call your attention to the data of Table I., and here incorporate, as my Table No. V., a part of Dr. Richter's Table No. VII., which shows the comparative humidity and wind velocity in the winter, spring, summer, and autumn. In the winter, the relative humidity at Santa Barbara is 67 per cent. and at Pine Crest 55 per cent., while the wind rate is 3.6 miles and 4.6 miles per hour, respectively. In the spring, the relative humidity is, respectively, 71 per cent. and 66 per cent., and the wind rate 4.5 miles and 4.4 miles. In the summer, the relative humidity is 75 per cent. and 69 per cent., and the wind rate 4.2 miles and 2.6 miles, while in the autumn, the relative humidity is 71 per cent. and 61 per cent., and the wind rate 3.4 miles and 3.7 miles, respectively.

The mean relative humidity for the entire year at Santa Barbara is 71, according to Table I., and the average hourly wind

rate is 4 miles, or, according to Dr. Richter, only 3.9 miles. The greatest daily wind movement recorded in the statistics of the Santa Barbara Chamber of Commerce (*Report*, 1901, p. 13) was 402 miles for twenty-four hours, an average hourly velocity of nearly 17 miles. These data show the comparative absence of high winds at Santa Barbara and the foothill region.

There are a few days in the spring months when disagreeably strong northwest or north winds prevail. During his experience of nine years, the writer has never observed more than eight or ten such windy days in any one spring. The prevailing winds are from the southwest and from the northwest.

There is a daily ocean breeze from the south, or southwest, described in the enumeration of the meteorological conditions influencing the Santa Barbara climate, and a nightly land breeze in the opposite direction. The prevailing winds are apt to be characterized by sudden gusts or blasts, followed by an interval of complete calm. Very rarely, a strong north wind from the desert causes a disagreeable sand storm.

Concerning the *purity of the air* at Santa Barbara and at Pine Crest, I can only say that the air is constantly changed by the alternation of ocean and of mountain currents, coming from regions where pollution is unknown. The air at Pine Crest and in the whole foothill region is, naturally, far more pure than in the city, where dust from the streets, emanations from sewers, and smoke from the houses and shops must vitiate the air. The dust is often objectionable in the town, during the dry season (from May to December), but recent experiments show that this difficulty may be obviated by sprinkling the streets with crude oil, which is obtained at Summerland, six miles from Santa Barbara.

Recapitulating the chief features of the Santa Barbara climate, I beg to mention its abundant sunshine, its low average rainfall, its notable uniformity of temperature, its comparatively low relative humidity, its low average wind velocity, and the purity of its atmosphere, advantages which it owes to its low latitude and its sheltered position, to the topography of the surrounding country, and to the proximity of the sea.

Patients with chronic rheumatism, asthma, and advanced tuberculosis generally do badly at Santa Barbara, but the writer has seen several cases of asthma cured by a residence in the foothills. Chronic rheumatism seems to require greater warmth, and advanced tubercular disease even greater dryness of air than can be found at Santa Barbara.

The climate of Santa Barbara and of its foothill region exerts a favorable influence upon neurasthenia, cardiac diseases, renal affections, arrested pulmonary tuberculosis, and chronic bronchitis.

The last-named disease is particularly benefited by the climate of the foothills.

The climate is also admirably adapted to the needs of young children, of people with feeble vitality, of old people, of convalescents from acute diseases, and of all those invalids and pleasure seekers who require an abundance of sunshine, pure air, and continuous out-of-door life.

There the invalid will find, among the foothills, warmer winter nights than at any other place in California, and may safely spend his time out-of-doors, in all but ten or twelve days of the year, sleeping comfortably, nearly all the year round, under the stars, whose brilliancy is proverbial.

DISCUSSION

Dr. W. Jarvis Barlow: I should like to thank Dr. Flint for this paper, and particularly for dwelling on the fogs along the Pacific coast. Especially do they occur in May and June, and from what I can gather during the seven years I have been in Southern California, it seems that the chronic cases of tuberculosis and rheumatic troubles do better from July 1st until January 1st; then, I presume, from the dampness and fog occurring more or less from January to July 1st, they do better away from the coast up in the foothills or up in the higher altitudes, where the fog does not occur.

I was glad that Dr. Flint spoke about the equilibrium occurring at night; we have found it very marked along the coast, and it allows people to sleep outdoors with so much comfort. The interval from 5 to 8 is the time when difficulty from chill and dampness occurs; then there is an equilibrium occurring from about 9 to 10 o'clock, which makes it very comfortable for people to sleep out-of-doors during the night the year round.

THE CLIMATOLOGY OF MUSKOKA, ONTARIO, CANADA.

By J. H. ELLIOTT, M.B.,
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The district of Muskoka lies on the eastern shores of Georgian Bay, between the counties of Simcoe, Ontario, and Victoria on the south, and the district of Parry Sound on the north; its southern portion is 100 miles distant from Toronto.

The forty-fifth parallel of latitude passes through it, and its longitude is about 80° west. It lies practically due north of Pittsburg, Pa., and Charleston, S. C., is in the latitude of St. Paul and Minneapolis and the northern portion of the Yellowstone Park, and is about one degree higher in latitude than the Adirondacks. It has been well named the "Highlands of Ontario." The elevation is very moderate, varying from 600 to 1400 feet. The shores of Georgian Bay are 580 feet above sea level, the Muskoka Lakes (Muskoka, Rosseau, and Joseph) 750 feet, Huntsville and the Lake of Bays about 1000 feet, while the northeast corner reaches 1400 feet. This part is only a few miles distant from the Algonquin National Park, a reservation of over a million acres, from which radiate three great lake and river systems of the province—the French, Magnetawan and Muskoka Rivers to the west, the Petawawa and Ottawa to the east, and the Trent system to the south. The stations of the Canada Atlantic Railway in this portion of the park have an elevation of 1300 to 1600 feet.

TABLE OF ELEVATIONS ALONG LINE OF GRAND TRUNK RAILWAY IN MUSKOKA.

Miles from Toronto.		*Elevation.*
100.1	Severn Station	730
100.3	Severn River, water, 697; rail	724
104.0	Kasheshe-bogamog River, water, 710; rail	719
105.9	Kilworthy Station	755
109.4	Summit	851
111.4	Gravenhurst Station	818
112.4	Muskoka Wharf Station	749
	Muskoka Lake, water (August 21, 1900)	745
117.8	Summit, ground, 3450 feet south, 916; rail	910
120.5	South Branch, Muskoka River, water, 745; bed, 730; rail	806
121.3	North Branch, Muskoka River, water, 778; bed, 776; rail	821
121.6	Bracebridge Station	817
126.3	Falkenburg Station	957
128.0	Summit, ground, 1069; rail	1058
131.8	Depression, ground, 983; rail	998
135.1	Utterson Station	1041
135.8	Summit, ground, 1071; rail	1057
138.4	Allensville, road crossing	970
139.9	Caswell Lake, water, 1001; rail	1011
141.0	Summit, ground, 500 feet north, 1066; rail	1049
145.9	Huntsville Station	957
146.1	Vernon Lake, water	936
146.5	Vernon River, water, 936; rail	972
147.8	Summit, ground, 1012; rail	1001
150.2	East River, water, 938; rail	961
155.4	Novar Station	1075

To the hunter and angler the Muskoka Lakes District offers a great variety. Deer, bear, fox, rabbit, and partridge are numerous, while the fishing grounds for black bass, maskinonge, pickerel, salmon trout and speckled trout cannot be surpassed. It is estimated that each year over 12,000 deer are killed during the open season in November, but owing to the protection given them and the excellent cover and feeding grounds their numbers continue to increase rather than decrease.

Writers have derived the word Muskoka from various sources. The word is of Indian origin. Musque-doh, "Clear-sky land," is the signification usually given to it, and this seems a very plausible one and has been generally accepted. Others trace it to Mus-quo-tah, signifying "red ground," referring to the rusty color of the soil and rocks in places; but there is little doubt that the district derives its name from the Missasaga chief, Muskoka or Mesqua-Ukee (not-easily-turned-back-in-the-day-of-battle),

who fought with the British in the war of 1812, and was given a medal. His tribe lived along the north shore of Lake Ontario and east of Lake Simcoe, and, though Muskoka still possesses deer and game in abundance, it must then have been a hunter's paradise. The south branch of the Muskoka River was the patrimony of this warrior and hunter. Little could he have thought, as he yearly sought sport and recreation in these northern wilds, that a century later it would be peopled each summer by thousands seeking rest and health during their summer vacation.

Muskoka is an unorganized district, having no municipal government, but being under the direct control of the Ontario Legislature, owing to its being so sparsely settled. In it are twenty-one townships, and it covers an area, roughly, of 1500 square miles. The population is about 21,000.

The rock formation throughout Muskoka is the Laurentian, a continuation of that which extends throughout northern Ontario and Quebec. It is not mountainous, but a succession of jutting boulders and huge hog-backs covered with vegetation, except where denuded by forest fires. Scattered through it are hundreds of pretty lakes, all of which are dotted with islands. Only rarely does the soil come to the water's edge; either rocks or sand beaches form the shore line everywhere, while the islands for the most part are huge masses of rock rising boldly out of the water, verdure clad. In the three lakes, Muskoka (22 miles long), Rosseau and Joseph (each 16 miles long), are over 400 islands.

Pine and hemlock abound everywhere. The principal deciduous trees are the sugar-maple, beech, basswood (linden), and the birches. The silver birch and aspen are seen everywhere, blending their pale green with the deeper green of the larger trees.

The flora of the district is a very rich one. The Alpine flora of Northern Canada begins here, while all the plants of Ontario, except the southernmost, find a home. Within a radius of a mile of the sanatorium at Gravenhurst over 300 species of flowering plants are to be found, while the lichens, mosses, and ferns grow in abundance and most luxuriously; the great Osmundas are almost tropical in their growth, very fine specimens of club mosses are found everywhere, and pitcher plants and various

orchids, particularly Habenaria, Cypripedium, and Pogonia, reveal themselves, not to the hurrying tourist, but to those who know their favorite haunts.

The summers are warm, with, as a rule, cool nights. Only occasionally is there a night which is uncomfortably warm. The mean daily maximum for June, July, and August is 77.4° and mean daily minimum 53.3°. During September it becomes noticeably cooler, the mean daily maximum being 69.3° and mean daily minimum 48.0°. Late September and early October are delightful with the gorgeous coloring of the maples and oaks, mixed with the yellows and browns of the beeches, aspens, and birches, with the green background of pines and hemlocks or the dull reds and browns of the granite rocks or the gray and green of the lichens and mosses which flourish on them. No pen can draw a picture of the beauty of the lakes and islands during the changes of autumn.

Snow appears in flurries during November, and about December 1st the ground is covered, remaining so until March. Winter thaws are unusual; once the snow comes it remains, and sleighing once established remains good until spring. Rarely is there the succession of snow and rain so frequent in the region of Lake Ontario and Erie. The lakes freeze over late in November or early in December, and do not open again until April. The thickness of ice will vary from sixteen to twenty-four or even thirty inches. Though the air in winter is cold, it is comparatively dry and is not penetrating, and sitting out-of-doors or driving is made very comfortable by means of furs and rugs. The mean temperature for the four winter months, December to March, is 19.1°, and the mean relative humidity is 81°, the air holding only about 0.9 grain of moisture per cubic foot, or one-third the moisture of air at 60°, which has a relative humidity of only 50°. The mean daily maximum for the four months is 26° and mean daily minimum 9.5°. Mean monthly maximum 45.2°. Mean monthly minimum 20.3°. Mean yearly minimum 31.7°.

As a rule, the wind drops when the mercury reaches zero or a few points below, and with a temperature of —10° or —20° the

atmosphere is still and clear. Some of the most perfect days are when the temperature is below this; not a cloud in the sky, the snow crisp and sparkling in the sunlight, and the smoke from fires rising straight up into the air. The total annual snowfall is 99.4 inches, there being an average of 18 to 24 inches usually on the ground.

April and May, which are the spring months, have a mean temperature of 47.9°, a mean daily maximum of 57.9°, a mean daily minimum of 36°, and mean relative humidity of 60°. Thus the climate is not humid, but moderately dry. The rainfall for the two months is 4.08 inches, April having a mean of seven days on which rain falls, and May having eleven. Mean snowfall for April, 2.2 inches; May, 0.2 inches.

The first of the wild flowers appear in March or early April, before the snow has disappeared, and by the first of May the woods are carpeted with them, hepatica, claytonia, trillium, dicentra, violets, tiarella, and hosts of others, while later the secluded places and sphagnum woods abound in laurel, andromeda, and many other of the heaths. The rocks, too, are covered with the bloom of blueberries, huckleberries, strawberries, and wild cherries, which later bear a profusion of fruit.

The following table of temperature, rainfall, etc., at Gravenhurst (770 feet), latitude 44.54° north, longitude 79.20° west, is, with the exception of relative humidity, from observations by T. M. Robinson, Esq., covering a period of thirty-two years. Instruments used, those of the Dominion Meteorological Service. The relative humidity is from personal observations, covering three years, Negretti and Zambra thermometers. Sunshine from recorder of the "burning" type over a period of two years.

For the following table I am indebted to Prof. Stupart, Director of the Meteorological Service of Canada:

Temperature, Rainfall, etc., at Gravenhurst, Ont.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Mean temperature	15.5	14.7	24.7	41.8	53.9	63.7	67.7	65.3	57.7	46.5	33.7	21.7	42.2
Maximum	40.8	43.2	49.9	71.8	80.2	87.1	91.0	89.4	83.3	74.1	58.7	46.9	93.2
Minimum	-25.0	-28.0	-13.7	11.9	30.1	34.2	42.7	39.9	30.4	22.9	7.9	-14.4	-31.7
Mean daily max. .	24.2	25.7	23.7	51.5	64.4	75.9	78.7	77.5	69.3	57.0	40.5	30.4	
" " min. .	5.8	5.1	12.7	30.1	42.0	51.9	55.4	52.5	48.0	37.9	27.8	14.4	
" " range .	18.4	20.6	11.0	21.4	22.4	24.0	23.3	25.0	21.3	19.1	12.7	16.0	19.6
Rainfall in inches .	0.73	0.44	1.30	1.39	2.69	3.44	3.02	3.30	3.23	2.92	1.84	1.44	25.74
Rain, No. of days .	3	2	4	7	11	10	9	9	11	10	7	5	88
Snowfall in inches	26.1	18.6	12.1	2.2	0.2	...	...	...	...	1.9	13.2	25.1	99.4
Snow, No. of days	14	11	8	2	1	...	...	...	...	2	8	12	58
No. of clear days .	11	13	15	17	15	17	19	20	18	16	10	10	181
" cloudy days	20	15	16	13	16	13	12	11	12	15	20	21	184
Mean humidity . .	87	81	70	60	60	68	68	76	76	76	84	86	74

Prevailing Winds during Year. From tri-daily Observations.

N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	C.
126	29	84	148	158	71	166	103	210

Mean Proportion of Bright Sunshine. Gravenhurst, two years' Observations.

	1902		1903	
	Mean proportion.	*Days completely clouded.*	*Mean proportion.*	*Days completely clouded.*
May	0.46	1	0.68	2
June.	0.46	0	0.50	0
July	0.54	1	0.58	0
August	0.57	0	0.50	2
September	0.35	8	0.43	1
October	0.40	5	0.45	4
November	0.29	10	0.36	7
December	0.33	10	0.29	13
January	0.25	12	0.25	13
February	0.28	15	0.43	6
March	0.34	9	0.35	9
April	0.53	3	0.41	3

Mean of two years' sunshine 1902 0.40
" " " " 1903 0.44

Days each year completely clouded . . . 1902 74
" " " " " . . . 1903

The skies in Muskoka are wonderfully clear, there being a remarkable freedom from haze and dust. The freedom from dust is well evidenced in the winter, the snow retaining its whiteness and purity through the spring until it has quite disappeared. Never does one see the snow-banks during mild weather a mass of dirt and muddy snow. There is a hazy aspect over the skies, particularly about the horizon, during the ideal Indian summer weather, which appears during the autumn.

Lumbering is the chief industry, and, as there is comparatively little land under cultivation, there is a minimum of dust.

Public highways, with the exception of one or two leading roads, are little used, and this factor is unimportant. The purity of the atmosphere is well attested by the fact that suppuration of wounds is very rare, healing by first intention being the rule.

Fogs occur but seldom, varying from four to ten in each year, and these always dispersing when the sun comes out.

I extract the following from the 1898 *Transactions of the Astronomical and Physical Society of Toronto:* "Mr. John A. Paterson, who had just returned from a holiday trip, spoke enthusiastically of the serenity of the skies in the Muskoka district. Last August I visited a pleasantly sequestered nook in the Georgian Bay, bearing the mellifluous name of Honey Harbor, and there the evening sky was to me a revelation. The transparency of the air is such that the ordinary eye is as good as a telescope eye of moderate power here. Here we do not and cannot see the glories of the heavens as they look down on us, but in Muskoka the bosom of old night seems on fire and sparkles with as many colored glories as the hilt of King Arthur's sword Excalibur!"

The following, also bearing on the clear atmosphere of Muskoka, I extract from a paper by the president of the same astronomical society.

"I have often wondered why the attention of tourists is not called to the ideal conditions which exist in Muskoka and our northern districts for the observation of the sun, moon, and stars. Having spent portions of seven summers in that truly delightful region, and having availed myself of nearly every opportunity that

Fig. 1.

The Muskoka Lakes, with their numerous islands.

Fig. 2.

Echo Rock, Lake Joseph, showing the typical rock formation.

was offered, I have over and over again been impressed by the signal advantages everywhere present for making astronomical observations. In no other place has it been my fortune to see the sun with so white a disk, or the moon with such a silvery sheen, or the stars of such brilliance. By day the skies are as blue as the skies of Italy, and by night as black as those of the tropics. Against the Ethiopian hue of the night sky celestial objects stand out clear-cut and with marvellous beauty. The atmosphere is pellucid. Setting stars can be followed down to the very horizon, and I have often seen Capella, that lovely sun in Auriga, skirting through the branches or the distant tree-tops along the northwestern sky-line. In other less favorable localities stars are commonly bedimmed by or lost in the low-hanging mist, dust, and haze, which either blur or effectually extinguish them before they set. During the past summer I was surprised at the wealth of detail revealed day after day upon the sun, especially where there were spots and faculæ, and night after night upon the moon, and in the interesting planetary systems of Jupiter and Saturn. I quite agree with the celebrated American astronomer who spends his holidays in Muskoka, that in our northern districts a first-class field-glass will usually do the work of a small but excellent telescope used almost anywhere farther south. Then, in addition to the peculiar astronomical observational advantages, there are frequent displays of auroræ and atmospheric effects of unrivalled variety and beauty. The latter include gorgeous sunsets, mock suns, solar halos, and rays. Not infrequently the sun goes down in skies which beggar the powers of description, flecked as they are by fleecy clouds of opalescent tints, contrasting with rich crimsons, lakes, carmines, and other brilliant colors, thrown upon golden-green backgrounds, and shading through all the tints of blue, from the faintest hues in the west to the deepest tones overhead, and to almost black purples in the east."

The water in Muskoka is particularly pure. The rivers and lakes show in the sunlight a mass of blue and silver, but looking into their depths, especially in the rivers, they possess a brownish aspect. Throughout Northern Ontario the rivers are dark, due to

the vegetable matter in solution taken up from their sources and along their beds, and remaining unprecipitated, owing to the softness of the water and the absence of metallic salts. Rushing over rocks and boulders, and passing through a sparsely settled country with little possibility of contamination, the waters are free from impurities. They are, too, peculiarly free of any degree of hardness, owing to the absence of lime in the Laurentian rock, which is the only system in the district; even the well water is comparatively soft. The following table shows an analysis of the water of Lake Muskoka, made by Dr. J. A. Amyot, provincial bacteriologist. I have also tabulated analysis of well water taken from a twelve-foot well in the woods, about eighteen feet from the shore of the lake, and that of a seepage spring passing through meadow and wooded land. These three sources form the water supply of the Muskoka Cottage Sanatorium and the Muskoka Free Hospital for Consumptives, Gravenhurst.

	1. *Well water M. C. S.*	2. *Lake water.*	3. *Free Hospital supply.*
Color	None	Straw yellow.	Yellower than No. 2.
Odor (cold)	None	None	None
Odor (after heating)	None	None	None
Parts per million:			
Albuminoid ammonia	0.085	0.19	0.095
Free ammonia	0.055	0.04	0.085
Nitrogen as nitrites and nitrates	0.220	0.08	0.345
Oxygen consumed	4.00	13.20	11.40
Chlorine	4.00	4.00	4.00
Total hardness	13.00	5.00	8.00

No iron was found in residue from 200 c.c. water evaporated to dryness.

A bacteriological examination of three samples taken from Gull Lake showed no colon bacilli, and of bacteria of all kinds 33, 34, and 23 colonies per c.c., respectively.

The town of Gravenhurst (population 2500) lies between these two lakes, touching both of them.

One very noticeable feature in Muskoka is that in the hottest summer weather it is perfectly safe to go about with the head bare. What there is in the atmosphere to account for this I cannot say, but the average summer resident goes about hatless throughout the season, and sunstroke is unknown.

Fig. 3.

Sunset at Bala Falls, the outlet of the Muskoka Lakes.

Sufferers from hay fever have in Muskoka immunity from their distressing attacks, and each year an increasing number of these patients make the district their objective point during the autumn. It is unusual to see a case in which the symptoms do not disappear within twenty-four hours of arrival, while if the date of the attack is anticipated none of the symptoms develop. Asthma, too, is markedly relieved by residence in Muskoka. I have seen many cases of long standing materially improved, with an entire cessation of paroxysms, without medication. Pneumonia is comparatively rare, many physicians rarely seeing more than one or two cases in a year. In over 1000 cases of pulmonary tuberculosis under personal observation, I have never seen lobar pneumonia develop. Simple anæmias are quickly benefited by a residence in Muskoka, with the out-of-door life and the acquirement of what is commonly known as the Muskoka appetite.

The wonderful variety of scenery, of rock, lake, river, and forest, with the adaptability of the surroundings to meet the varying moods of the neurasthenic, make it a splendid place for such cases.

For many years the district has been growing in favor as suitable for the treatment of pulmonary tuberculosis. At first patients were sent only for the summer months, but since the establishment of the two Sanatoria of the National Sanitarium Association of Canada, the experience of Trudeau in the Adirondacks has been found to hold here also—that in winter cases do better even than in summer, and its value as a place of winter residence is becoming more recognized.[1] The severe winters are enjoyed by the robust patient and those whose recuperative powers are good, but render it unsuitable for the advanced case with anæmia and poor capillary circulation, who is weak and cannot stand the cold. But it is really surprising to see how many come to us who say it will be impossible for them to sit out during the winter, and who, in a very short time, are inquiring whether there will be any objection to sleeping with the temperature of the bedroom 30° instead of 45°.

[1] Vide editorial Canada Lancet, May, 1904.

The presence of so much water in the lakes and rivers has been urged as an objection to its being a suitable climate for pulmonary invalids, but I am each year more convinced of the value of time spent on the lake in boating, canoeing, or sailing, both to those who are strong enough to indulge in the exercise themselves and to those unable to take active exercise, who must perforce leave the management of their craft to others.

The death rate in Muskoka for 1902 was 11.2 per 1000. The rate is increased by the accidents incident to lumbering, saw mills, etc., while the influx of thousands during the summer season also increases the rate.

The islands and shores of the Muskoka Lakes are dotted with hundreds of cottages, occupied during the summer months by visitors from all parts of the United States and Canada, from an unpretentious camp or shack to the club-house or the villa which has cost many thousands. Canoes, yachts, dingies, and launches ply the waters everywhere, while the large boats of the Muskoka Navigation Company make all points on the lakes accessible by their twice daily trips. Muskoka wharf at Gravenhurst is the distributing point for these lakes.

The Lake of Bays district is reached from Huntsville. Though more recently opened, it is rapidly building up with camps and cottages. It is somewhat higher than the Muskoka Lakes, but otherwise similar.

The Georgian Bay region of Muskoka, with its 30,000 islands, is reached by boat from Midland or Penetanguishene, but is accessible only during the summer months.

The cost of living is everywhere moderate, and the tastes of all are catered to, from the modest farm-house at $3.00 or $4.00 per week to the better-equipped hotel at $8.00 to $12.00, while the "Royal Muskoka" in Lake Rosseau affords the comforts and luxuries of the most modern summer resort.

Muskoka is reached by the trains of the Grand Trunk Railway, which are run solid from Buffalo and Toronto to Muskoka wharf and Huntsville.

To sum up, Muskoka is a sparsely settled district, readily accessible, abounding in the beauties of nature. The winters are

Fig. 4.

Muskoka Cottage Sanatorium: Administration Building, established 1896 by the National Sanitarium Association of Canada. The first in Canada for the treatment of pulmonary tuberculosis; 70 beds.

Fig. 5.

Muskoka Free Hospital for Consumptives: Administration Building, established 1901 by the National Sanitarium Association of Canada; maintained by voluntary contributions; 75 beds.

cold and free from rain, fog, and dampness; the spring and autumn often rainy, but beautiful; the summer ideal in warm days and cool (not cold) nights. Game and fish abundant. The cost of living very moderate. No hay fever; no malaria; no dust. A clear atmosphere. Highly suitable for anæmic, neurasthenic cases, for the weary business man seeking relaxation, recreation, and sport, for the asthmatic, and practically all pulmonary invalids.

SOME WEATHER OBSERVATIONS IN THE ADIRONDACKS.

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ADIRONDACK COTTAGE SANITARIUM, SARANAC LAKE, N. Y.

The weather observations upon which this paper is based were taken for about five years in the village of Saranac Lake, on a partially protected slope with a western exposure of about 1550 feet elevation. During the remainder of the time the observations were made at the Adirondack Cottage Sanitarium, situated one-half mile north of the village of Saranac Lake, on a hillside with a northeastern exposure at an elevation of 1625 feet.

The Adirondack Mountains lie in the northern part of New York State, between latitude 42° 30′ and 44° 30′, and longitude 74° and 75° 30′ west, covering roughly an area about 125 miles square. The average elevation is 1600 feet, with peaks 1000 to 3000 feet higher, extending, in general, toward the southwest and northeast in several irregular ranges. The soil is composed chiefly of light sand, very porous, and glacial drift, and moraines are common. Except along some of the more frequented roadways, the whole region is rather densely wooded. Deciduous and evergreen trees occur in about equal proportions. A majority of the peaks and lesser elevations are wooded to the top, and with each season present varying hues and colors that render the landscape beautiful. The whole region abounds in lakes and streams, which form one of its chief charms. Several rivers rise from these lakes, among them the Hudson, the Raquette, the Saranac, the St. Regis, and the Beaver Rivers. The greater part of the shores and banks of the lakes and rivers are wooded to the very water's edge. Most of the lakes are small, but the Saranac Lakes

(Upper and Lower), Tupper Lake, Lake Placid, and a few others have a length of from five to ten or more miles. An idea of the frequency of the lakes and streams is conceived when it is known that one can start at Fulton Chain and go to Saranac Lake, a distance of 100 miles or more, making short portages or "carries" between some of the lakes. The Adirondack region is well protected from the ocean by the White and Green Mountain Ranges. Lake Ontario modifies the western slope, while the northern is under much the same influences as the St. Lawrence Valley.

THE TEMPERATURE OF THE ATMOSPHERE. The mean annual temperature for Saranac Lake was 41.57° for the ten years ending December 31, 1903. The monthly means varied from 14.98° for January to 66.24° for July, and are as follows:

January	14.98°	May	53.63°	September	57.24°
February	15.62	June	62.50	October	45.67
March	28.14	July	66.24	November	32.09
April	40.65	August	62.84	December	19.23

The mean maximum for this time was 52.47°, and the mean minimum 30.67°. The mean daily range was 21.8°, being greatest in the summer. January and February are the coldest two months, with mean minimums of 3.98° and 4.76°. June, July, and August are the warmest three months, with mean maximums 74.23°, 77.86°, and 74.51°, respectively. The nights are always cool, and it is rare that one does not require blankets.

The records show that during the period under observation a temperature of 90° has been recorded but nineteen times, and during the last two years the thermometer has not reached that figure. On the other hand, on about 180 days each year 32° or less is registered. The highest recorded temperature is 95°, on July 5, 1897; the lowest, 38°, on February 16, 1896. July is usually the warmest month and January the coldest.

The solar temperature has not been recorded.

ATMOSPHERIC MOISTURE. The hygrometric state of the air has not been investigated. Last fall a sling psychrometer was used for one month, September 26th to October 26th, at 8 A.M., 1 P.M., and 6 P.M. The average readings for this month were as follows: 8 A.M., 78.4 per cent.; 1 P.M., 61.4 per cent.; 6 P.M., 76 per cent.

Precipitation. The average annual precipitation for ten years was 34.55 inches. The mean monthly precipitation was 2.88 inches, and varied from 2.07 inches in April to 4.12 inches in July. The mean monthly figures are as follows :

	Inches.		*Inches.*		*Inches.*
January	2.29	May	2.95	September	3.15
February	2.25	June	3.80	October	2.70
March	2.80	July	4.12	November	2.56
April	2.07	August	3.48	December	2.38

The average yearly snowfall was 90.74 inches. A trace of snow fell in September, nearly an inch in October, 11 in November, 13 in December, 21 in January, 21 in February, 16 in March, 6 in April, and 1½ in May. From this it is seen that, with the exception of June, July, and August, snow falls every month, and averages for the year slightly more than 7½ feet. Consequently one-quarter of the precipitation (exactly 26 per cent.) is in the form of snow. The lakes and ponds are frozen from the latter part of November to March, and at times the ice does not break up until May. These frozen water-ways are used extensively for driving and hauling in winter.

There is 0.01 inch or more precipitation on 145 days each year, or on 12 days out of each month. The average number of rainy and snowy days per month is as follows :

January	14.0	May	11.7	September	9.6
February	12.6	June	11.1	October	11.5
March	12.8	July	13.2	November	12.7
April	10.0	August	11.9	December	14.2

During December, January, and February the precipitation is almost entirely in the form of snow. The number of rainy days in these three months are on an average about seven. During November and March the snowy days (16) are nearly double the rainy days in number, while in April the number of snowy days (3) are considerably less than half the number of rainy days.

From these figures we gather that from the first of November to the first of April there is 0.01 inch or more precipitation in 66 days. Of these 66 days rain occurred on 15 days and snow on 51 days. Many of the rainy days were partly snowy.

The porous nature of the soil enables the rainfall to be rapidly

absorbed, and many walks and drives are much pleasanter just after a rain. There are only a few clay beds in the Adirondacks, and throughout this whole region there is but little soil of such a character as to retain moisture. A region of numerous bodies of water in the form of mountain lakes, with rocky shores and sandy beaches, differs materially, climatically considered, from a similar region with a heavy soil, retaining moisture.

Fogs and mists vary much with local conditions. In some localities they occur rarely; in others, along the rivers and on the lake shores, they are of more frequent occurrence. However, even where they occur they are rarely seen, except in the early morning hours. In the intense cold of winter mists are seen occasionally along the unfrozen parts of the river.

The barometer readings for thirteen months show a mean monthly average of 28.412 inches. The highest monthly mean was in June (28.55), the lowest in February (28.22). The readings were taken in-doors at an elevation of 1550 feet:

September	28.521	January	28.331	May	28.460
October	28.377	February	28.224	June	28.547
November	28.405	March	28.373	July	28.435
December	28.460	April	28.400	August	28.412

THE SKY. The average annual number of clear days is 121.9, or 10.2 days per month. They are distributed as follows:

January	8.8	May	13.0	September	12.7
February	7.6	June	13.3	October	10.7
March	8.6	July	11.2	November	6.7
April	11.0	August	12 0	December	6.3

The number of clear days was larger than I supposed, and compares very favorably with most "cool moist climates."

The number of cloudy days slightly exceed the number of clear days, and are 128.9 days per year. They occur as follows:

January	14.1	May	8.4	September	8.2
February	12.6	June	6.0	October	12.4
March	12.2	July	6.3	November	15.4
April	10.5	August	5.7	December	17.1

From this it is seen that the number of cloudy days is quite high, but, on the other hand, the number of partly cloudy days is very small. The greatest number of cloudy days occur in

November, December, and January. The partly cloudy days number 114, and vary from 7.5 days in December to 13.5 days in July.

The average percentage of possible sunshine for the last few years is 46.2 per cent., and is distributed as follows:

January	25.8	May	71 8	September	65.1
February	35.7	June	46.2	October	36.2
March	46.0	July	55.0	November	41.3
April	55.5	August	46.3	December	29.7

These records cover too short a time to be of value. The high percentage for May was due to the fact that last year a severe drought extended throughout the spring months.

Temperature alone, as is well known, does not express fully the effect of local conditions on persons of varying temperament. Coming to the Adirondacks regularly in summer from any of the cities of the Atlantic coast, one is impressed by the coolness and the amount of energy one feels like expending. In nearly all cases warmer clothes have to be worn. Permanent residents of the region seem to feel a slight rise of temperature in the summer much more than the visitors.

The purity of the air can almost be said to be a *sine qua non* of a pulmonary health resort. Many resorts, no doubt, owe considerable of their beneficial influence to this quality of the air. In general, the greater the elevation the greater is the purity of the air. But other factors have to be considered, and among these are the density of the population, smoke, the velocity and frequency of the wind, and the condition of the soil. The first point is well illustrated by the following figures: In London the number of solid particles in each c.c. of air is from 80,000 to 210,000, while that of the western highlands of Scotland is only 16.

The amount of dust in the air and, *cæteris paribus*, the number of micro-organisms depend largely upon the wind and the condition of the soil. The greater the velocity and frequency of the wind, the greater the quantity of the dust. For this reason forests which break the winds and which prevent them from reaching the soil are very valuable in preventing dust. Snow, too, is

most valuable for this reason, for when the ground is covered with snow there can be little or no dust. Rain, as has been often stated, is valuable both for precipitating impurities in the atmosphere and for preventing dust. No one, I think, will deny that the atmosphere in the Adirondacks, with its 145 days of precipitation, is well cleansed. From what has been said it can be easily seen that the greater part of the Adirondack region is wooded and has its climate modified accordingly. Further, the ground is covered with snow for a little over four months each year. The prevailing winds in the region about Saranac Lake are from the west, but, with the exception of a few days in the spring and fall, the wind causes little inconvenience to one leading an out-door life. In summer on the eastern shores of the many lakes the cool breezes over the water modify the mid-day temperatures and are always refreshing, and make the shores several degrees cooler than elsewhere in the same region.

In conclusion it may be said that :

1. The climate of the Adirondack Mountains is cool and moist during seven months of the year ; cold and dry during five months.

2. The entire region enjoys freedom from dust and disagreeable winds.

3. The number of clear days is small, the number of cloudy days excessive, and the number of partly cloudy days much below the general average.

In closing I wish to express my thanks to Dr. E. R. Baldwin, who recorded the weather observations for five years, and to Dr. Richard Dutton and Mr. C. W. Mills.

A METEOROLOGICAL STUDY OF THE WINTER OF 1903–1904.

By CARROLL E. EDSON, M.D.,
DENVER, COL.

The winter of 1903-1904 was an interesting one from the standpoint of its weather, and some of its meteorological data teach a lesson of sufficient value, I believe, to present to the Society.

The collation and comparison of meteorological statistics involve frequently a kind and amount of labor for which many persons have no inclination, but the results of such study may be tabulated or reduced to graphic form so as to make easy the lesson hidden in the reports of the Weather Bureau.

I have been led to write this paper for two reasons:

1. The winter has been sufficiently pronounced in some of its characteristics, especially in the East, to attract the attention of those even whose work does not ordinarily lead to study of meteorological conditions. To compare the recorded statistics of such a winter with the data of the mean weather conditions as meteorologically expressed, emphasizes better than any other way what must be read into these reports as published in climatic works, in order to obtain the clear picture of the actual weather of a given place. To learn what the actual figures of such a winter as the past are gives the student a live measure for his general use.

2. The comparative study of the weather in various parts of the country during this winter teaches a lesson of great therapeutic value to which I wish to call your attention.

I have selected for this study only the period of the winter from November 1, 1903, to April 1, 1904, a period of five months, or 152 days, and have taken the six cities of Boston, New York, Philadelphia, Buffalo, Chicago, and Denver.

The nearness to each other of New York and Philadelphia

makes their meteorological conditions very similar, but the detailed data show some interesting differences.

My statistics are taken from the monthly reports of the United States Weather Bureau, and are therefore comparable, being taken accurately under similar conditions of observation and time.

So far, therefore, as material is concerned, I have nothing new to offer, but wish simply to point out what is already contained in apparently uninteresting columns of figures. As far as possible, I have reduced my findings to a graphic form, as being time-saving and most demonstrative of the relative conditions in the several cities. The tables on which these diagrams are based and which accompany the paper I will refrain from reading.

TEMPERATURE. The mean temperature of the several months and the mean temperature of the corresponding month for the period of the last thirty-three years are shown in Table A.

TABLE A.—Mean Temperature.

	Boston.		New York.		Philadelphia.	
	Average of 33 years.	1903.	33 years.	1903.	33 years.	1903.
November . .	(41)	40.0	(44)	42.0	(45)	42.4
December . .	(31)	28.9	(34)	30.0	(36)	31.7
		1904		1904		1904
January . .	(27)	21.6	(30)	24.0	(32)	25.8
February . .	(28)	22.6	(31)	25.0	(33)	27.4
March . . .	(34)	34.6	(38)	36.0	(40)	39.4
	Buffalo.		Chicago.		Denver.	
	Average of 33 years.	1903.	33 years.	1903.	33 years.	1903.
November . .	(39)	37.6	(38)	36.4	(39.5)	41.2
December . .	(29)	25.5	(29)	20.1	(32)	36.3
		1904		1904		1904
January . .	(25)	19.2	(24)	17.8	(29)	31.0
February . .	(24)	16.9	(26)	17.2	(32)	40.2
March . . .	(31)	32.4	(34)	35.2	(39)	42.5

Table B. gives the average daily excess or deficiency of temperature over the mean of thirty-three years.

TABLE B.—Average daily excess (+) and deficiency (—) of Temperature over Mean of thirty-three years.

1903.	Boston.	New York.	Philadelphia.	Buffalo.	Chicago.	Denver.
November,	—1.0	—2.4	—2.3	—1.0	—2.4	+1.8
December,	—2.0	—4.0	—3.8	—4.0	—8.9	+3.9
1904.						
January,	—5.8	—6.2	—6.1	—6.0	—6.0	+1.8
February,	—5.5	—6.0	—5.8	—7.0	—8.5	+8.3
March,	+0.2	—1.2	—0.2	+1.0	+0.7	+3.6

It will be seen that Boston had a daily average lower temperature than normal of from 1° to 5.8°, save in March, when it was a small fraction, 0.2° over the mean. New York was below, all the time, from 1.2° to 6.2° daily; Philadelphia from 0.2° to 6.1° colder; Buffalo from 1° to 7°, save in March, when it was 1° above the average. Chicago, also, was a fraction above the mean in March, but showed, until then, a daily average deficiency of from 2.4° to 8.9°. Denver, on the other hand, experienced a winter steadily warmer than usual by a daily average of from 1.8° to 8.3°.

Table C., which follows, shows the mean maximum and mean minimum temperatures and the actual highest and lowest. A study of these tables shows the general range of the thermometer.

TABLE C.—Mean Maximum and Mean Minimum Temperatures.

	Boston.		New York.		Philadelphia.	
1903.	Max.	Min.	Max.	Min.	Max.	Min.
November	47.0	33.0	48.0	35.0	49.8	35.2
December	36.6	21.3	36.0	24.0	38.2	25.3
1904.						
January	29.0	14.1	30.0	18.0	32.4	19.5
February	31.3	13.8	33.0	17.0	35.2	19.2
March	41.9	27.2	43.0	30.0	46.5	32.3
1930.	Buffalo.		Chicago.		Denver.	
	Max.	Min.	Max.	Min.	Max.	Min.
November	42.8	32.4	42.9	30.0	54.6	27.6
December	31.1	19.7	27.5	12.6	49.4	23.2
1904.						
January	26.0	12.4	24.4	11.0	43.3	18.3
February	24.2	9.4	24.4	9.9	53.8	26.6
March	39.1	25.7	41.9	28.1	56.0	29.0

Actual Highest and Lowest.

	Boston.		New York.		Philadelphia.	
1903.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
November	74	15	70	17	72	18
December	55	2	52	7	53	10
1904.						
January.	46	—6	55	—4	56	—2
February	49	—1	53	1	57	5
March	70	8	64	17	68	17
1903.	Buffalo.		Chicago.		Denver.	
November	63	14	63	12	74	3
December	52	3	40	—13	63	3
1904.						
January	54	—4	39	—15	64	—2
February	50	—8	53	— 6	73	12
March	60	10	65	13	71	4

It will be seen that the winter set in early in Boston, New York, Philadelphia, Buffalo, and Chicago, continued late, and was colder than usual. Calculating the number of days in each month on which the temperature was above or below the mean of the months, I found that the low mean of the months was not the result of a few excessively cold days, as sometimes occurs, but that the whole winter in the East was steadily colder than usual. In Denver it was, throughout, warmer.

Going a little into detail, Table D. gives the number of days on which the maximum temperature was at freezing, or below 32°.

TABLE D.—Number of Days with Maximum Temperature at 32° or lower.

1903.	Boston.	New York.	Philadelphia.	Buffalo.	Chicago.	Denver.
November	5	5	4	9	10	2
December	11	9	7	16	21	2
1904.						
January	18	17	15	20	24	4
February	17	17	11	20	20	0
March	4	2	2	9	7	0
Total	55	50	39	74	82	8

The maximum temperatures are the most important to the physician, as the minimum temperatures occur at night, when his patient is in bed and but little affected by them, while the maximum temperature determines, to a certain degree, the length and comfort of the invalid's out-door stay.

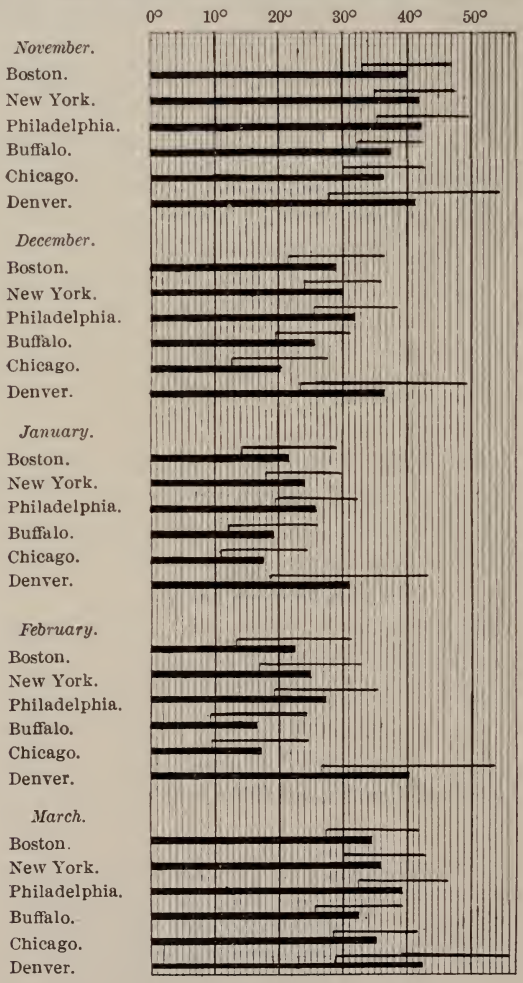
From the table it will be seen that of the 152 days studied Boston had 55, or more than one-third, below freezing all day; New York had 50, or nearly one third of them all, below freezing; Philadelphia, 39, about one-fourth; Buffalo, 74, or nearly one-half; Chicago, 85, over one-half, and Denver but 8, or only one-nineteenth.

This relative number of cold days is most clearly appreciated in Chart I.

CHART I.—Number of days on which the maximum temperature was 32° or lower.

Of days when the maximum temperature was 20° or lower, Boston had 9, New York 9, Philadelphia 6, Buffalo 26, Chicago 30, Denver none.

CHART II.—Mean temperatures, with mean maximum and mean minimum.



Boston had two days below 10° all day, Buffalo 7, Chicago 7. Buffalo had 1 day with a maximum of zero, and Chicago 1 day with a maximum below zero.

These few days of very low temperature, while showing an unusual freedom from "cold waves," emphasize the conclusion stated above, that the great deficiency in the mean temperature was due to continuous, steady cold all winter, and not to intermittent spells of excessive cold. There is an importance in this for the out-door life of an invalid. With a low mean temperature he may still be out much of the time, if the mean is the result of a few excessive cold periods, for, during such cold days, the temporary housing necessitated is of comparatively little harm, while, if the low mean is the result of a continuous cold, it may cause a sensitive patient to lose a large portion of his needed out-door stay.

Chart II., showing the mean temperature by months, with the comparative range of the mean maximum and mean minimum readings, disclosed the fact that during January the mean minimum temperature in Denver was above the mean of Buffalo and Chicago, and in February higher than the mean maximum of those cities. In other words, in February it was warmer in the coldest part of the night in Denver than it was in the warmest part of the day in Buffalo or Chicago.

Relative Humidity. Closely associated with the temperature of the air in affecting the comfort is the humidity, the discomfort of both extremes, heat or cold, being increased by a high relative humidity.

Table E. gives the mean relative humidity in the several cities at morning and night.

Table E.—Mean Relative Humidity.

	Boston.		New York.		Philadelphia.	
1903.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.
November	68.0	61.0	70.5	60.6	69.3	60.1
December	72.0	66.0	72.2	63.5	68.1	62.2
1904.						
January	78.0	76.0	69.8	72.7	75.0	70.4
February	72.0	68.0	63.0	59.6	69.6	63.2
March	68.0	67.0	74.7	64.1	74.4	64.7
	Buffalo.		Chicago.		Denver.	
1903.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.
November	74.5	68.2	77.0	65.0	69.0	55.0
December	75.0	76.2	88.0	80.0	62.0	60.0
1904.						
January	76.4	78.1	90.0	80.0	69.0	58.0
February	69.9	72.3	87.0	79.0	59.0	43.0
March	76.6	75.6	83.0	80.0	66.0	52.0

Starting with the humidity of the early morning, before the air is warmed by the sun, the relative higher or lower figures at night give some index as to the degree of rawness during the day. If the amount of moisture, actual, remains the same, as the air warms the relative humidity will fall. Accordingly, if the relative humidity rises as the day goes on (and the air is warmed), and is higher at night, there has been an actual increase in the amount of moisture, or else a fall in the temperature during the day. In either case cold and chilly rawness has been a feature of the day.

Studying Table E. with this in view, it will be seen that there is a comparatively small drop in the relative humidity at night in most of the lines, and that often there is an actual rise. The extremely high humidity in both Chicago and Buffalo, and the frequent higher night humidity in the latter city, are to be noted. Boston showed an average higher humidity in the morning over the evening of 4°; New York of 8°, save in January, when the humidity was higher at night by 2.9°; Philadelphia of 7°; Chicago of 8°; Denver of 11°; while Buffalo has the damp, chilly record of being higher at night in December, January, and February—the cold months—by an average of 1.7°, and in November and March a morning higher humidity of 3.7°, or averaging for the whole winter a higher morning humidity of only 0.4°.

TABLE F.—Sunshine, November, 1903, to April, 1904.

	Boston.	New York.	Philadelphia.	Buffalo.	Chicago.	Denver.
Actual hours,	860	766	906	439	733	1034
Possible hours,	1554	1564	1575	1530	1554	1575
Per ct. obtained,	55.3	48.9	57.4	28.6	47.1	65.6
Sunshine per cent. obtained by months.						
1903.						
November . .	61.0	58.9	68.0	40 0	56.2	64.0
December . .	58.9	50.0	60.6	20.0	47.0	77.0
1904.						
January . .	51.1	43.6	53.4	32.0	43.0	67.0
February . .	53.2	57.0	61.4	20.0	46.7	68.0
March . . .	53.1	37.7	46.3	33.0	43.7	56.0

SUNSHINE. The total number of hours of actual sunshine and the percentage of the total possible are given in Table F. for the

winter and by the months, and the percentage for the wole period is shown in Chart III.

CHART III.—Actual sunshine possible.

Not only the total percentage of sunshine, but its distribution, is of importance in studying the relative availability of out-door life; for the effect of sunshine and cloud is not only that upon the temperature and moisture, but a positive one upon the mental well-being of a patient.

The study of the proportion of sunshine and cloud for the last winter is interesting.

Table G. shows the number of wholly cloudy, partly cloudy, and clear days in each month, and the total number of days on which 0.01 of an inch of precipitation fell.

TABLE G.—Number of Cloudy, Partly Cloudy, and Clear Days.

	Boston.	New York.	Philadelphia.	Buffalo.	Chicago.	Denver.
Clear.						
1903.						
November	15	17	12	3	10	15
December	16	10	16	0	6	22
1904.						
January	12	14	12	1	7	15
February	12	14	10	2	5	12
March	12	10	9	3	3	7
Total	67	65	59	9	31	71
Partly Cloudy.						
1903.						
November	3	5	12	7	11	12
December	3	10	5	4	14	8
1904.						
January	6	3	4	6	9	13
February	5	6	7	5	10	16
March	13	5	7	9	11	18
Total	30	29	35	31	55	67

Cloudy

1903.						
November . .	12	8	6	20	9	3
December . .	12	11	10	27	11	1
1904.						
January . . .	13	14	15	24	15	3
February . .	12	9	12	22	14	1
March . . .	6	16	15	19	17	6
Total . .	55	58	58	112	66	14
Total No. of days with 0.01 in. precipitation	60	50	46	106	61	18

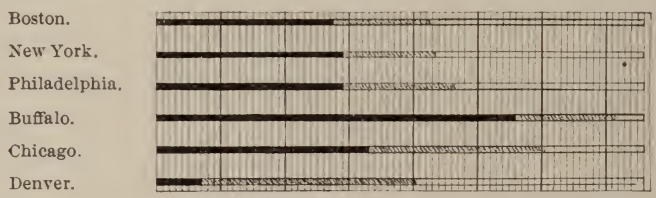
Of the 152 days studied, Boston had 55 wholly cloudy days; New York 58, Philadelphia 58, Buffalo 112, Chicago 66, and Denver 14.

Of fully clear days, Boston had 67, New York 65, Philadelphia 59, Buffalo only 9, Chicago 31, and Denver 71.

For continued pall of cloud Buffalo holds the record; out of 152 days there were only 9 sunny days.

Chart IV. shows the relative number of days of cloudy, partly cloudy, and clear weather.

CHART IV.—Number of cloudy, partly cloudy, and clear days.



The depressing effect of continued cloudy weather, without any sunshine, is very great, and in winter, especially, long absence of sunshine greatly hinders out-door life. A study, therefore, of the distribution and duration of the wholly cloudy days becomes of some interest.

I have reckoned the number of times there was a period of total cloudiness of three consecutive days, and find that Boston had two periods of 4 days, four periods of 3 days, and, in addition, nine periods of 2 days; New York had two periods of 5 days, one of 4 days, one of 3 days, and ten of 2 days; Philadelphia had one period of 5 days, two of 4, four of 3, and also

seven of 2 days; Buffalo had the unenviable record of one period of 12 consecutive wholly cloudy days, one of 11, one of 8, three of 7, two of 6, three of 5, two of 4, four of 3, and also three of 2 days; Chicago had two of 6 days, one of 5, one of 4, three of 3, and eight of 2 days; Denver had no period of two days, even, of consecutive total cloudiness.

None of the periods above stated are included in any other, and they are all apart from partly cloudy days, being each of them a series of consecutive totally cloudy days.

Precipitation. The past winter has been one of marked snowfall throughout the East, the general impression being of an unusual amount. On studying the records, however, it will be found that the precipitation was in general below the mean of the last thirty-four years. Table H. gives the precipitation by months, and in a parallel column the mean for that month.

Table H.—Precipitation in Inches.

	Boston.		New York.		Philadelphia.	
	Average 33 yrs.	1903–1904.	Aver.	1903–1904.	Aver.	1903–1904.
November,	4.23	1.48	3.60	0.90	3.19	1.03
December,	3.28	2.57	3.37	2.81	2.86	3.29
January,	3.81	4.80	3.80	3.38	3.28	3.14
February,	3.51	2 49	3.84	2.18	3.39	2.21
March,	4.21	2.43	4.05	3.44	3.46	3.24
Total,	19.04	13.77	18.66	12.71	16.28	12.91

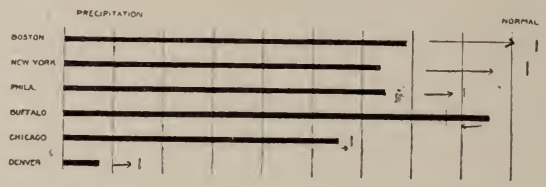
	Buffalo.		Chicago.		Denver.	
	Aver.	1903–1904.	Aver.	1903–1904.	Aver.	1903–1904.
November,	3.44	1.36	2.59	0.34	0.54	0.07
December,	3.39	3.07	2.11	2.28	0.65	0.23
January,	3.21	4.77	2.05	2.25	0.48	0.04
February,	2.99	4.32	2.30	1.71	0.50	0.17
March,	2.07	3.51	2.59	4.57	0.91	0.94
Total,	15.10	17.03	11.64	11.15	3.08	1.45

It will be seen that Buffalo alone had more than the usual precipitation. Chart V. makes the comparison easy, the small perpendicular lines addressed by an arrow indicating the point of mean precipitation beyond that of this winter.

That a less precipitation than usual should give rise to a general impression of an excess is due to the fact that, owing to the cold weather, the low temperature, the precipitation was as snow rather than rain, and, owing to the persistent low temperature, this snow did not melt as usual from time to time in periods of thaw, but

remained on the ground as snow and ice, encumbering the streets and making progress difficult. A slight difference in the mean temperature would have made a great difference in the impression of the winter.

CHART V.



No better instance could be selected to show the importance of studying meteorological data side by side, each feature compared with the other, if we are to obtain a true picture of the conditions actually present. To read the totals of any column alone will almost necessarily give a wrong idea, even of that factor, but there must be juxtaposition and constant reference; the sunshine, the temperature, the precipitation must be read together, if they are to mean anything, and give a clear picture of the actual conditions.

TABLE K.—Wind, total miles per month and highest recorded velocity for five-minute period.

	Boston.		New York.		Philadelphia.	
1903.	Total.	Highest.	Total.	Highest.	Total.	Highest.
November,	7,108	33	9,881	59	7,298	29
December,	9,555	46	12,449	62	9,043	46
January,	8,583	37	11,522	54	8,570	36
February,	8,558	40	12,393	62	8,312	35
March.	8,617	39	11,519	65	6,681	31
Total,	42,421		57,764		39,904	
Average monthly movement	8,484		11,553		7,981	

	Buffalo.		Chicago.		Denver.	
1903.	Total.	Highest.	Total.	Highest.	Total.	Highest.
November,	11,614	62	12,200	69	5,698	45
December,	15,621	65	13,240	52	6,712	54
January,	12,468	58	12,614	54	6,891	40
February,	12,550	66	12,998	48	6,695	51
March,	11,970	60	12,761	52	7,360	52
Total,	64,223		63,813		33,276	
Average monthly movement	12,845		12,763		6,655	

WIND. The total wind movement each month is shown in Table K., and in the small column the highest velocity during any five-minute record.

It will be more easily appreciated by reducing the total wind movement to a proportion in smaller figures, which gives Boston 84, New York 115, Philadelphia 79, Buffalo 128, Chicago 127, Denver 66, as shown in Chart VI.

CHART VI.—Wind. Total movement.

In reading the tables, too, it must be remembered that the air is lighter at Denver than in any of the seaboard or low level cities.

The winter just passed may be described, then, as regards Boston, New York, Philadelphia, Buffalo, and Chicago, as setting in earlier than usual, lasting longer, and being somewhat colder than the mean, this coldness, however, being due not to the depressing effect of cold waves, so much as to a continuous, steady cold, without much let up. For this reason the precipitation, though less than usual, save in Buffalo, was more noticeable, coming as snow and remaining frozen on the ground. The cloudiness, especially in Buffalo, was extreme.

In Denver, on the other hand, the winter was one of unusual mildness, small precipitation, very even temperature, and abundant sunny, clear days.

The therapeutic lesson, to which I wish to call attention by the foregoing meteorological study, is that of the importance and advantage of selecting the climate in the care of pulmonary tuberculosis.

The present position of appreciation of the importance of fresh air, sunshine, and nutrition in the treatment of phthisis has been slowly attained. The progress from drugs and palliation to the

insistence on control of the simple, hygienic living has been by stages. As in all lines of human thought, so in therapy, the tendency has been to see but one point at a time—to lay stress on one factor to the neglect of others. In the general advance of our knowledge of phthisis and its care, one stage was marked by the great emphasis laid on climate, and we heard only of the climatic treatment as distinct from the medical as if climate was in itself an entity and a specific force.

A frequent result of this narrowness and separation of ideas was that patients were sent away for a "change of climate," to a supposedly "proper climate," away from home and allowed to shift for themselves, neglecting all details of control and hygienic living, placing such matters in the intelligent care of the climate. Much evil resulted from this course, as might have been expected. Many and marvellous cures were often made. Of the untold failures, many might have been avoided.

Gradually, as the appreciation of the need for close oversight and control of the patient became more keen, it was found that the discipline of a sanatorium was of great help. Patients were noted to recover their health at home with their own native "weather," without the aid of "climate," once more investing climate with an air of specific gravity.

Then we heard for a while of "the sanatorium treatment" as distinct from the medicinal or the climatic, another stage in our advance, but still marked by the old "one-idea" tendency. The advantage which this sanatorium control, brought about by its close oversight of all the details of life, food, out-door exercise, and so on, was seen in the cures resulting in many "closed institutions." Our present better knowledge of the disease and its proper management by control of all details of hygienic living out-of-doors, is due, in part, to such study as was made possible in an institution.

As a result there has been, lately, considerable remark by various writers, that "climatic stations" are of no great importance; that food, sunlight, and fresh air are all that are needed. "Out-of-doors is all— anywhere is good enough." Again, the old tendency to see but one thing at a time! But is it true?

Granted that the important factors, as we now know them, in the care of pulmonary tuberculosis are, after-control of the patient and his living, food, fresh air, sunshine, and out-door life. Are these latter helps the same everywhere? By no means, and even the brief comparison of the winter just made must prove that some places offer more opportunity to the invalid to live comfortably out-of-doors than do others.

Leaving, for the present, wholly out of the question any especial advantage of high elevation upon the patient or his disease, taking only the elements of the weather as just discussed, is there no choice? If the patient is to have the closest control, the most nutritious food in the greatest abundance, the most carefully regulated exercise, and a constant life in the open air, ought he not to be given the greatest opportunity to lead that life? Fresh air is fresh air; sunlight is sunlight. The air in Buffalo, for instance, was probably just as fresh as in Denver, and the same sun illumes it, but was that fresh air as available to the patient? In the one city, out of 152 days, 112 totally cloudy; in the other, 18.

Or could a patient ordered to keep quiet spend as many hours out-of-doors with a mean temperature of 18° in Chicago as in Denver, where the mean minimum was much of the time higher than the maximum of Chicago?

Climate is not a thing in itself; it is only the conditions of sun and rain and heat and cold and wind prevailing in any place. It is not a treatment of anything, but in a disease in which our weapons are discipline, food, and out-door life, a study of meteorological conditions will enable us to place the patient where he can obtain the best opportunity for living that out-door life most constantly and most comfortably.

It is not necessary to press individual comparison farther. I have said enough to show that a study of such tables as I have given in this paper will prove that all weather is not the same, that all fresh air is not equally good, and that a location like that of Denver does offer, by the conditions of its climate, its lack of storm, its absence of cloud, and its warmer sunshine, definite advantages for the out-door life so essential to the welfare of the tuberculous invalid.

DISCUSSION ON PAPERS OF DRS. ELLIOTT, BROWN, AND EDSON.

Dr. E. O. Otis: Those of us from Boston and the East appear to be put on the defensive regarding our despised climate, and it seems to me that perhaps we can persuade some of our Colorado climatic expert colleagues to form a sort of syndicate and come and aid us in "promoting" our Eastern climate with the same enthusiasm they have evinced in making known their own admirable one. (Laughter.)

Seriously, however, I would like to call your attention to the paper of our colleague, Dr. Bowditch, presented at our meeting last year at Washington, upon "Subsequent Histories of Seventy-nine Arrested Cases of Phthisis Treated at the Sharon Sanatorium from 1891 to 1902," as indicating what can be accomplished in the successful treatment of pulmonary tuberculosis in an Eastern climate, and in the vicinity of Boston.

One other point. You noticed in the charts Dr. Edson exhibited that the climate of Buffalo appeared to be at about the bottom of the list. Comparatively, it showed the smallest amount of sunshine and the largest percentage of rainfall; and yet Miss Lillian Brandt has shown in a very interesting paper upon the "Social Aspects of Tuberculosis," published in the *Handbook on the Prevention of Tuberculosis*, by the Charity Organization Society of New York, that of the twelve principal cities of this country Buffalo has the smallest death rate from consumption, namely, 1.29 per 1000. This simply shows that there are many other factors besides climate which influence the prevalence of tuberculosis, and are to be considered in its treatment.

Dr. Delancey Rochester: I am much obliged to Dr. Otis. I wanted to get up and say something, but I must say that I agree with most of the statements Dr. Edson has made in his paper, that the essential treatment of tuberculosis is fresh air and sunshine, food, etc.; that if we can get a climate that gives us the most favorable results, the sooner we send our patients to that climate the better; but we cannot send most of our patients there; the vast majority of them cannot go out to Denver, and we have to treat some of them at home; and I was going to quote the very same paper that Dr. Otis has just quoted to show that we can do pretty well even in dirty, wet, and cloudy Buffalo with patients suffering from tuberculosis.

I have had four cases of moderately advanced tuberculosis recover in Buffalo. I was going to say five, but one of them has, unfortunately, recurred this spring after an abeyance of symptoms for four years. But four cases have recovered completely, and three of them had cavities, one of them a cavity in both lungs, and they recovered in Buffalo on simply living out-of-doors and paying attention to food and hygiene generally. However, we are

not discussing tuberculosis, but simply climatology here in this special paper; and I want to say that I most heartly and thoroughly approve of Dr. Edson's paper—the spirit of it and the comparisons of it.

There is one thing I wish he had put in in his comparison—that is, some of the California cities. I would like to know how they compare with Denver and the Eastern cities. You know there are many of our friends living in California tell us that California has a great deal better climate than Denver and other places for the cure of tuberculosis, and I should like to have had the same comparison made with reference to the California cities as with these other cities.

Dr. Beverley Robinson referred to the late Dr. Austin Flint's careful tabulated autopsy records, made twenty-five years ago, which show that a large proportion of tuberculous persons inevitably, under good or bad conditions, get well. These records have not been superseded. There is a certain limitation in almost all diseases, and this must be kept in mind in properly estimating the value of any particular place as a resort.

Dr. W. Jarvis Barlow: There is just one point that I wish to speak of—the point that Dr. Edson made in regard to the winter in Denver being so very mild in 1903–1904 when the winter in the East had been very severe. I made some inquiry throughout the western slope, and the southwestern part especially, of Arizona and California, and I find in general all through these sections that the past winter was milder than usual; and two years ago, the winter being milder here in the East, it was more severe with us in California. I did not take occasion, then, to inquire about Arizona. I am quite interested to hear that Colorado's winter was mild, corresponding with the Southwest.

Dr. E. Fletcher Ingals: I was much interested in the paper on climate, but regret that only one winter was taken in the comparison of the conditions in the various cities. Denver had a beautiful winter last year, as I know, but no one can tell what next winter will be. Last winter we had it cold in the East; we may have it warm this year. The paper well illustrates the necessity of considering many years in drawing conclusions from statistics. The paper brought out strongly the fact that we must not consider simply the number of rainy or cloudy days, or the open-air treatment, or the food alone, but we must carefully weigh all of the factors that, taken together, constitute the patients' environment.

Dr. Robinson's remarks recall not only the admirable work of the late Austin Flint, but the fact shown by his writings, that a large percentage of people recover from tuberculosis. This we often forget in studying the effects of climate as well as of other forms of treatment. We only have to go to the dead-house to find that 25 per cent. of all persons dying of other diseases have had pulmonary tuberculosis at some time. Statistics show that only 12 per

cent. die of this disease. This means that 37 per cent. of the human family have pulmonary tuberculosis sufficiently severe to cause marked lesions, and that 66 per cent. of these get well, while only one-third die, no matter where they are or what they do. Dr. Austin Flint thought that most of those who got well had never been treated for the disease. I do not think he laid this to the physicians, but that he thought they had not been ill enough to seek medical advice.

Chicago has a long black line on the chart, but really I do not see why any one should complain of our climate, for we can get any kind of weather we want in the course of two or three days.

Dr. Beverley Robinson: I would like to rise to a correction. I am afraid Dr. Ingals will leave a wrong impression if he stated that Austin Flint said 66 per cent. get well. That is very much too large a figure. I think 15 per cent. is the extreme.

Dr. R. H. Babcock: Apropos of Dr. Ingals' remark, some wag has said that the climate of Chicago would be all right if it wasn't for the weather.

There are three points with which I am especially impressed in listening to the papers and the discussion this morning. The first is that tuberculous patients get well in any climate under any weather conditions provided they are properly managed. The second is that unquestionably there are some climates in which the proper management of these tuberculous patients is very much easier. Now, I think this last is a very important consideration. The members of the American Climatological Association are presumably all physiotherapists of more or less experience, and it explains why Dr. Rochester gets results in Buffalo which other men in Buffalo would not get. We who meet with tuberculous patients in consultation with the rank and file of the profession are only too sadly impressed with the ignorance, or indifference, or carelessness, or all combined, of the average doctor in the management of his tuberculous clientele. The average physician is not sufficiently informed concerning the best methods of utilizing climate at home, or he will not take the trouble to so impress his patients or so instruct them as to render it possible for them to secure good results in the home climate. Therefore, such papers as we have had this morning—and especially the last one—it seems to me are very valuable in showing to the rank and file of the profession that if they will not properly manage their tuberculous patients at home there are climates to which they can be sent and where they will get results with very much greater ease.

The third point I should like to dwell on for a moment is that we are not to think merely of our tuberculous patients. The charts which have been shown illustrating the character of the climate in our Eastern cities indicate that we, as physicians, should urge all persons who have any respiratory, circulatory,

or renal disorders to get out of the winter climate at home when it is possible. I think we are apt to think of climate with reference almost exclusively to tuberculous patients, and that is not right; we must think of these climates with reference to patients exposed to the dangers of bronchitis and pneumonia, and certainly the climates of California and Colorado cannot for a moment be compared in their disastrous effects on these patients with the climates where most of us are compelled to reside.

Dr. Henry Sewall: One word in protest against the notion (which it seems to me unfortunate to have to go down on our minutes) that a person who is shown to be afflicted with consumption of the lungs has a very good chance of getting well. I do not believe anything of the kind. When one can discover tuberculous lesions in the lungs of a man I think it means that he has been progressively diseased for months, and very often for years; and, provided that man does not make a change in his habits of life more important than that of habitat, I think that in the majority of cases he dies. Having had a very good personal experience in graduating from this disease of tuberculosis of the lungs, I know that the psychical relation of climate, to consider no other factor, is most vivid to the sufferer himself. I know that when I went from Baltimore—with its humid, depressing air—to the Adirondacks (even though it there rained nearly steadily three weeks day and night) I improved every minute of the time. I know that one year there clinched the efforts of the vital powers as against the disease; and since those days thirteen or fourteen years' residence in Denver has made me feel absolutely cured. Personally, when I discover the signs of tuberculosis in a patient I feel that he is on the brink of a precipice, and I advise him that the only reasonable hope for safety lies in definite hygienic habits, and possibly a change of habitat as well.

Dr. Frederick I. Knight: I think the Association ought to be congratulated on a return to the discussion of climatology. It seems to have been almost entirely absent from the records for a good many years now, and I certainly am very glad to see that we are going to devote a part of our time, at any rate, to this very important subject. It seems to me, as far as the treatment of tuberculosis is concerned, as Dr. Rochester says, we have been so impressed with the fact that a man could recover in any climate that we forgot really that it was possible to give him the benefit of this very important climatic factor; and I think that we have been misled, also, by the post-mortem appearance of cured tuberculosis. We must remember that those cases where we find slight scars are generally in patients who have never had clinical tuberculosis, and we cannot judge by them of the proportion of possible cures in patients who have advanced to show clinical tuberculosis.

Another thing that has influenced our prejudice in regard to the treatment is the fact that we have got hold of cases so much earlier, and diagnoses are

made so much earlier; and for that reason I was a little inclined to differ from the opinion just expressed—that in regard to the possibility of cure. It seems to me in getting hold of the very earlier cases that we may, especially with the aid of the climatic change, get absolute cure and feel pretty confident of it in a large proportion of cases. Personally, in regard to advising change of climate, of course I do not feel that it is necessary in every case, but the fact that so many men formerly went to the Rocky Mountains, for instance, with marked phthisical tuberculosis and got well without any particular care, from simple change—went there and lived their ordinary life and got well when they surely would have died in the East—still remains a very important argument in favor of change in some cases, and it seems to me that it is necessary above all to consider the conditions carefully in regard to each individual case when it comes up, including the climatic factor, in order that we may do our duty to the patient. If it is impossible for any reason to consider the factor of climatic change, then we must do the best we can at home.

Dr. W. F. R. Phillips: I merely propose to make a few remarks in regard to climatic statistics gathered from individual towns. Dr. Edson has shown us graphically the climatology, or the climatic conditions, of certain cities—Chicago, Buffalo, and others—that is, in the centre of those cities. We should always bear in mind that there are certain atmospheric differences between the city and the country; that each city, especially a large manufacturing city, has peculiarly a climatology of its own, and its statistics taken, as is most often the case, in the central part of the city cannot be accurately applied to the suburbs of that city. On this subject I wish just simply to speak a word of caution.

Another subject—simply in reference to the treatment of tuberculosis by change of climate. I am prompted to say something because of Dr. Sewall's remarks that he has himself once changed his climate, and that a change of climate was an absolute necessity in consumption. Now, if he is an example of what a change of climate will do, I am also an example of what staying in one's own climate will do. Thirteen years ago I had tuberculosis. I remained in the city of Washington with the exception of six months spent beyond the immediate influence of the city air, in the country just across the Potomac, while I had fever. When I got rid of the morning fever I returned to Washington despite the protests of our late distinguished member of this Society, Dr. W. W. Johnston, and all of my other friends. I was then in pretty bad condition, yet you can see what I am to-day.

Dr. W. H. Flint: I have little to add concerning the points offered in my paper. As regards the wind prevailing in Santa Barbara, it blows only at the rate of about four miles an hour, which is taken as the mean. When you take into consideration that a high wind rate is so disadvantageous to sufferers

from pulmonary disorders, one is inclined to emphasize the above-mentioned rate as being to the advantage of the Santa Barbara climate. I think the discussion as it has been presented this morning must give us a very hopeful outlook for the cure of tubercular troubles, no matter in what climate the attempt be undertaken, provided, as Dr. Sewall said, the patient is willing to change his mode of life. A great many people come to us and think they may stay in the hotel lobbies amid a cloud of tobacco smoke and go to all the evening entertainments, and still get the benefit the climate is supposed to confer —which is a very great error.

Dr. Elliott: Everything tends to one point of view, that there can be no rule regarding the treatment of tuberculosis so far as concerns medication or the assignment to a particular climate, but that each patient must be considered by himself. We must depend for cure on the patient living constantly out-of-doors, and, as Dr. Babcock has well said, some patients conform to this rule of living out-of-doors with much more ease than others; but if the patient can be persuaded to live out-of-doors under the care of a physician, or keep him while at home under proper conditions, they will get well no matter where they go. We must not lose sight of the point that we must treat the patient as a personal entity.

Dr. Brown: I was struck with the close similarity of the climate of Muskoka and the Adirondacks. I would like to add one thing, that if our patient in the Adirondacks sat out only when the weather was warm and clear I do not think he would sit out very much. Dr. Sewall says the first three weeks he was there it rained. In regard to change of climate, there is one point that has always struck me: the man who has not been accustomed to good hygienic surroundings, who has had poor food and bad environment, needs a change of climate very much less than a man who has had all those things.

Dr. Edson: Regarding the mildness of the winters in California, I have no statistics; but I have noticed, in watching the weather reports from month to month in the last few years, that it is very apt to happen that a rougher winter to the East of us in the Altantic coast region is accompanied by a milder winter than usual with us. That is a general impression, and, of course, of no more value than general impressions ordinarily, and probably inaccurate. Dr. Ingal's comment that it is not fair to take a single year, I will admit. I took this single year because the winter just past is now present in your minds, and if you can compare places for a single year clearly comparisons with other years are more definite.

In my paper I have a side column in every table giving the mean of the last thirty-three years, so that one can see what the slight variation of this one year has been. In the article I wrote on Denver in Wood's *Reference Handbook*, I have given an analysis of two successive winters: one, a winter very

similar to this last one of mildness, and one, an exceedingly rough winter—the roughest winter that we have had in Denver in the last fifteen years; and I have in that article compared those two winters in detail, the good winter with the bad winter, and both with the mean, which will enable one to see how much better our worst winters are than the good ones in some places.

Concerning Dr. Phillips' point—the centre of the city—I took the Weather Bureau's statistics purposely that I might compare, not the sanatorium site in Denver, where we are out of the smoke, but that we might compare the centre of our city with the centre of the other cities. The comparisons, I think, are fair, because they are all taken from the Weather Bureau stations, which are in the centre of each city, the outlying residence districts in each instance showing a proportionate clearer atmosphere.

THE HOMESTEAD, FROM THE EAST.

THE CLIMATE AND WATERS OF HOT SPRINGS, VIRGINIA.

By GUY HINSDALE, A.M., M.D.,
HOT SPRINGS, VA.

The Hot Springs of Virginia owe their popularity as a health resort to a remarkable combination of climate, a variety of mineral springs for external and internal use, a complete bathing equipment, and an establishment which provides accommodations of the first rank. Although a large proportion of visitors come for the treatment of various affections, there is much to attract the ordinary tourist.

Annual Summary.

Hot Springs, Bath Co., Va. Elevation 2265 feet.

1899.

Annual mean temperature		51.7°
August 4th, highest	91°	
February 10th, lowest	14°	
Total precipitation for the year		40.77 inches.
June, greatest monthly precipitation	7.60 inches.	
November, least " "	0.61 "	
Total snowfall		4 inches.
Number of rainy days		65
Number of clear days		222

1903.

Annual mean temperature		49.4°
August 25th, maximum	88°	
February 18th, minimum	—6°	
Total precipitation		47.66 inches.
June, greatest monthly precipitation	7.78 inches.	
May, least " "	1.25 "	
Total snowfall		19 inches.
Number of rainy days		112
Number of clear days		177

October, November, and December are the months of least precipitation; June and July are characterized by heavy thunder-storms. The average annual rainfall is 40 inches.

In 1903 the last killing frost was April 27th, and the first October 18th.

The climate is distinctly stimulant, as might be expected from an altitude of nearly 2400 feet in a valley among the mountains of Southwestern Virginia. Compared with New York, Boston, Philadelphia, or Chicago the air is rarer, dryer, purer, and more invigorating. The cold of winter is not so penetrating, and the summer heat never so intense.

The temperature at Hot Springs during the past winter, which was unusually severe, reached —6°. The highest recorded was 98° There is a wide diurnal variation, the summer nights are cool, and the mid-day temperatures in winter or summer are often 30° above the minimum at night.

The air is much dryer than at the seaboard. The soil is mixed with clay in the valleys, and the outcropping of the Shenandoah limestone accounts for the calcareous nature of the water. But close to the limestone are formations of trap and shale. The outcroppings of trap are vertical and form the backbone of the ridges so common in this portion of Virginia. The shale yields a purer and more palatable water, and it is this which affords the ordinary water for table use. The geological formation is a glacial drift, and most beautiful erosion effects are seen all through the valley. Great masses of limestone, gravel, and detritus are massed along the hillsides, and some remarkable effects have been produced. Water courses penetrate the soil for miles underground and emerge in bold streams from under the ridges, which rise a thousand feet above them.

One of the striking features of the locality are warm springs and cold springs in very close proximity. These may vary 45° within fifteen feet of each other, and evidently have their origin in widely different sources.

The mineral springs owe their efficiency mainly to the methods employed in their application. The Boiler Spring, which is used for bathing, has a natural temperature, when delivered in the baths, of 104°. It contains total solids of 34 grains per gallon, mainly calcium and magnesium carbonate and magnesium sulphate. Its contained gas, CO_2, amounts to twenty-four inches per gallon. The flow from this spring is about 130,000 gallons daily. This water is conveyed by gravity in protected iron pipes,

200 yards to the bath house, where it is used for the spout and tub baths. The pressure of the spout bath may be regulated up to a maximum of sixteen pounds to the square inch, and for the tub bath may be moderated with colder water. Cold water for douches can be had in every bath-room. The tubs are constructed so as to afford a strong, buoyant flow of water freely flowing over the sides and drained away. Connected with the twenty-six bath-rooms are rooms with couches for hot packs, for massage, and a solarium for rest afterward.

In addition, there is the latest and most complete hydrotherapeutic apparatus, the Baruch-Richter douche table, with circular, rain and scotch, jet and perineal douches and hot-air cabinets. It is probable that the Nauheim bath will be added shortly. Trained masseurs and attendants are employed. The physicians thus have at their command the very best combination of means for the successful treatment of gout, rheumatism, and many nervous diseases, including insomnia, neurasthenia, hysteria, hypochondria, and malnutrition.

There are walks of moderate and regular grade, with resting places every tenth of a mile, and mountain paths which are available for graded exercises and the reduction of overfatness. The climate and attractive scenery add much to the value of this resort.

The property of the Hot Springs Company embraces several thousand acres, and its natural beauties have been conserved by most intelligent engineering. The hotel, which accommodates over 600 guests, occupies an elevated knoll near the principal springs. It is a substantial brick building in the colonial style, and was built three years ago on the site of a former structure. Its reputation is of the highest order. While in no strict sense a sanatorium, it provides many of the features which invalids and others desiring medical treatment require. These include a diet menu, with unlimited milk served in sealed bottles from a dairy where the herd of Alderneys is inspected and tested at proper intervals; an ice plant in connection with the hotel, and a supervision of the springs and general water supply and sanitary arrangement by a competent chemist and hygienic expert, Dr. Henry Froehling, of Richmond. For the convenience of

bathers the hotel is connected with the bath house by an enclosed passage-way.

Bath house, Hot Springs, Virginia.

The waters are applied by attendants in accordance with prescriptions. These indicate the use of the spout, from a fixed nozzle delivering warm water, 104°, at a pressure of sixteen to eighteen pounds to the square inch; a tub bath at various temperatures from 95° to 104° for not over five to ten minutes, followed with a pack in three or four hot blankets, a cold douche, and an alcohol rub. The attendants may also rub the patients in the tub. Usually not all these features are employed in the same bath.

Analysis of Healing Spring Water.[1]

	Grains per gallon.		Grains per gallon.
Magnesium carbonate	3.435	Potassium sulphate	2.586
Magnesium sulphate	6.076	Potassium chloride	0.183
Calcium sulphate	2.380	Lithia carbonate	0.0356
Calcium carbonate	23.065	Ferrous carbonate	0.193
Sodium sulphate	1.673	Alumina	0.048
Sodium chloride	0.143	Silica	2.677

The Healing Springs, which are three miles distant, are owned by the Virginia Hot Springs Company, which also controls the Warm Spring, seven miles farther up the valley.

[1] By Dickore and Morgan, Cincinnati.

The Healing Springs water is the most efficacious and most generally used for internal administration at this resort. It contains 36 grains of total solids per gallon, principally calcium carbonate, magnesium sulphate, carbonate and sodium sulphate. It is considered, by reason of its diuretic properties and its acceptability to the stomach, the best water to eliminate uric acid from the system. Unlike the sulphur waters, it keeps well after transportation, and is suitable not only for use during a residence at the springs, but for the "after-treatment" at home. The magnesia, sulphur, and soda springs are also used as individual cases require. Their temperatures are 98.2°, 99.4°, and 74° respectively.

It is a common observation that a decided reaction follows the first three or four baths. This should be anticipated, and is in no sense an indication that the baths do not agree with the patient. This febrile reaction, with swellings of the affected joints, is the first step toward the elimination of morbid products.

It is not claimed that the marvellous results from bathing in these hot springs are due to absorption by the skin of the mineral constituents of the waters, but they are attributable rather to a temperature effect. The heat or cold stimulates the peripheral nerves of the skin, and these, in turn, favorably affect the central nervous system.

It is a well-established fact, not, perhaps, generally recognized, that water holding less saline matter in solution is more readily taken up into the blood stream than water containing much saline matter. The denser waters are liable to cause a sense of pressure and fulness of the stomach. The waters used at the Hot Springs of Virginia are of the lighter class, none of them containing over 36 grains of solid contents per gallon. The waters are therefore easily borne. The only objection is that in susceptible persons there may be slight constipation during their use.

Out-of-door sports are a great help in treating patients at the mountain spas. Exercises on the golf links, on horseback, and mountain climbing all have their place in treatment, and, properly used, make life attractive. On the other hand, there is a

great tendency at a fashionable resort to indulge in rich foods and to drink wines and strong liquors. These tend to undo the good effects produced by the baths and the climate. Too much stress cannot be placed on the proper regulation of diet and on abstinence from alcoholic drinks in the successful treatment of gout, rheumatism, and most nervous affections. Many visit the Hot Springs of Virginia and similar resorts to restore a proper function to the stomach, the kidneys, or the liver. The use of hot baths and diuretic waters accomplishes much ; as a rule, it is easier to break off bad habits at the springs than it is at home, and under new medical authority much can be done for these cases.

DISCUSSION.

Dr. William C. Rives: Hot Springs has a very pleasant summer climate, but it is not nearly so bracing as the climate of the Adirondacks. The nights are always cool, but it can be very hot during the middle of the day. It is below the altitude where white pine and spruce commonly grow, and among certain parts of the Virginias, where the climate is almost identical with that of the Adirondacks, there is, in particular, a limited region where these are the characteristic forest trees. There is one lesser advantage of the Hot Springs which prevails all through the Virginia mountains: there are no mosquitoes or black flies there; and, on the other hand, to counterbalance that advantage, there are occasional rattlesnakes.

Dr. I. H. Hance: I asked whether there was a prolonged or short exposure in the hot bath, because among those whom I see in Lakewood, and who have been in Hot Springs and taken the treatment, there has been a comment made that the effect of the bath was rather depressing, and they all spoke specially of the prolonged application of the hot water. For the neurasthenics this depressing effect of the bath should be avoided.

Dr. Hinsdale: I might say in answer to the question as to these warm baths being rather depressing to neurasthenics, that I saw the necessity, when I first considered going to Hot Springs, of having a different equipment so as to provide better methods of applying the waters.

The hot water, and especially the spout, is liable to be depressing, so that I secured the introduction of what is known as the Baruch-Richter table, which provides a flexible temperature and pressure, so that we can reduce the temperature of that water from the natural temperature of 104° or 105° down

to 55° if necessary. Since that has been introduced I have never tried the ordinary tubs and spout in cases of neurasthenia. They need the tonic treatment and the stimulus provided by the jet and Scotch douche, and the circular douche under pressure of perhaps ten to fifteen pounds to the square inch, and temperatures reduced from 105° down to the neighborhood of 60° if necessary. Those who suffer from rheumatism, especially in a debilitated state, experience these depressing influences from the hot spout; and, therefore, I think it is very necessary to apply the colder water afterward, so as not to leave the patient in a relaxed, depressed, wearied state.

No doubt a great many have been in the habit of taking the baths in a series of what has been known by "the course of twenty-one baths." There is no special influence in the number twenty-one that I know of, and very many can only take a half-dozen; some can take twelve or fifteen; others need forty to produce the desired effect; but if a large number of those are taken it is necessary to give an interim between every three or four, so that there will be a chance for the patient to gain strength.

Another thing: the duration of each bath varies. As a rule, the prescription may call at first for the hot spout or the douche at the natural temperature of the water; for about five minutes this is directed over the body; the patient stands under the fixed douche and receives it over the back, shoulders, thighs, and upper extremities; and then he takes the tub bath about five to ten minutes at 102° to 104°; lies in this flowing water, and then he is put into the hot pack for ten minutes, followed by an alcohol rub; but sometimes one or two of these measures is omitted and only a portion of the treatment given, so that there should be a great deal of discretion as to the use of the various elements of these baths with reference to different cases.

Dr. Robinson: It was only a few days ago that I was sending a relative of mine to Europe for a course of treatment at Franzensbad, and this relative of mine had been recommended to go to Franzensbad by a distinguished gynecologist of New York. After hearing his judgment of the matter, I concurred in believing it was a good place to go for the disease from which this lady suffered. What annoyed me for a while was the feeling that I did not know of any particular man that was thoroughly reliable at those springs to whom I could direct this person. I immediately thought of the man that probably knows more about German spas, and the men who are there, and their value than anybody else, and so I took the liberty of addressing a line to Dr. Jacobi and finding out from him what to do about it, and he told me. Now, then, what I want to say is this: that I think what we are suffering from at the present time in regard to certain European spas (and I think, perhaps, we may be suffering the same in regard to certain American spas) is that we do not actually know to whom to send our patients, feeling that when they go to

the particular spa they will be properly treated, intelligently treated, and not commercially treated.

I was at Schwabach a few years ago and was directed to a physician there (whom I will not mention) by a friend of mine in New York, and in the course of conversation with this man he said his position was made a very difficult one at times. In the first place, he said, patients came sometimes to the spa and he felt that they had been misdirected, namely, that they were not proper subjects for treatment at that spa. "Now," he said, "our position is a very difficult one under the circumstances. We do not wish in any way to cast any unpleasant reflection upon the knowledge of the physician who sent the patient away; and, on the other hand, those of us who think right and wish to act right do not wish to put such a patient through a course of treatment that will probably be prejudicial to the health, and we are, therefore, between the two horns of the dilemma and do the best we can; we give as little treatment as possible and say nothing prejudicial to the practitioner who wrongly sent the patient away. You can see at once that the patient may be a great sufferer." On the other hand, we know perfectly well that, after all, what people get from spa treatment in the main is getting away from their business, getting away from their little home cares, getting away from home worries; and, as Dr. Hinsdale said only a moment ago, a large number of people going to a spa will be willing, if properly guided and directed, to conform to certain dietary rules, a certain *regime*, a certain mode of life which it is very difficult to make those individuals conform to when they are in their own homes, or in their own city, or down where they have their place of business, and all the cares and worries incident thereto. Therefore, again, from that point of view it is most important that we should feel we have the right man at the place where we wish to send our patients.

As a New York physician, I feel that we have in the Hot Springs, Virginia, with which I am thoroughly familiar, a great many advantages for the maintaining of the health and strength of those who have it already, and for promoting it in those who go as patients. Once again, it is all-important and we may esteem ourselves especially happy that we have a man of experience and knowledge, and we believe thoroughly conscientious, who will guide our patients directed there, and I am most happy to say this.

OCEAN BATHING.

By PHILIP MARVEL, M.D.,
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Sea or ocean bathing is in nowise a novel subject. History informs us of its practice by the ancients, as well as by the early savage tribes. It has been an indulgence of all nations since the earliest periods of history, either as a religious ceremony, a bodily necessity in affording cleanliness, a means of restoring health, or a pleasurable pastime.

Melampus, a Grecian physician, who lived about one hundred and fifty years previous to the era of the Argonautic expedition, is said to have cured the daughter of Pratus, King of Argus, of a malady, which hitherto had resisted all remedial agencies, by the daily use of the cold bath and the internal administration of ferric oxide, the latter being obtained by exposing iron ore in a small vessel of water. As a fitting reward for his superior knowledge and skill, he is said to have received the hand of his fair patient in marriage and, in addition, one-half of her father's kingdom.

The foregoing is interesting from two standpoints, namely, first, so far as is known it is the first record of the administration of a mineral remedy for the cure of a disease, and second, it prescribed a treatment for anæmia, various nervous and functional disorders which the past ages have but slightly changed, forming a part of the rational treatment recommended to-day. Whether the application of cold baths, with or without the assistance of a mineral remedy, have in any subsequent cases been attended with such decidedly beneficial effects, or the author of a treatment has ever been remunerated with such a munificent gift, I must leave an open question. But that bathing, both

general and special, has been from time to time subject to the vicissitudes of numerous opinions and practices may be stated without further reference.

Galen seems to have been among the first of authorities to raise his voice against the excesses which are said to have occurred in the early history of excessive bathing, and he especially denounced the use of cold baths as "pernicious and only fit for barbarians"; but even the denouncement of one so great and renowned as Galen was not heeded; the people continued the practice of ocean and pool bathing as had the earlier generations.

Tradition brought from one generation to another the early beliefs and implanted into the minds of the people the favorable benefits to be derived from so accessible a remedy. The Romans especially, and other contemporary nations, are known to have expended enormous sums of money in fitting up establishments or bathing palaces, the ruins of which remain to-day, not alone an interesting monument of their extravagances, but also as evidence of their great belief in the efficacy of the bath.

I have been unable to fix by history the exact date of the beginning of ocean or sea bathing, but many references tend to show its great antiquity and that at one time it was almost universally resorted to for the cure of bodily ills.

Both the Indians and the early settlers of our country are known to have made frequent pilgrimages to the great sea, as well as to the mysterious springs, for periodical ablutions, having the assurance of their wonderful healing powers. But as time has gone on we have to some extent lost faith in the all-sufficiency of the bath; however, simultaneous with this loss of faith as a remedy for a health restorative, we have encouraged its indulgence as a pleasurable pastime, and in some instances the latter feature has so overshadowed the former that frequent and continued exposure has brought the sad experience of serious disturbances.

In considering the advantages *versus* the disadvantages of sea bathing we must not lose sight of the fact that it is impossible to separate it from the influences of the other agencies, such as temperature and the physical conditions of the atmosphere. And,

again, it is no less true that the physical and mental condition of the individual at the time of the bath may greatly modify or influence the effect; hence the question must be studied from a standpoint at once complex in itself. Sea water being composed of minerals such as chloride of sodium, magnesium, bromine, and iodine, is truly a mineral water, and an ocean bath, therefore, may properly be classified as a mineral bath. Since temperature is one of the agencies in the bath to be considered, we must regard the presence or absence of heat other than a positive quantity of either the water or the body. In nature's operations heat and cold are as necessary as they are wonderful, whether contemplated from their effect upon the human body, upon animal life in general, or upon inanimate matter. In the human body heat and cold answer only a relative action, and by this relative action so much depends upon the particular state and condition of the body at the time and the end to be subserved. They may be alike, first, salutary, and second, pernicious. I have observed those who for different reasons have been obliged to remain for hours submerged in the sea, and have noted both the slowing off and the enfeeblement of the pulse, the lowering of the temperature, and the evidence of general debility as exhibited by the loss to the various forces. I have also observed with equal interest those immersed for a time in warm water at a temperature higher than that of the body. Here the first influence was that of the speeding of the blood current, the stimulation and invigoration of the motor centres, the increasing of the cellular and glandular activities, and, as the exposure was prolonged, secondarily, the depressing influences became so marked as to completely derange the equanimity between the capillary and larger circulations, limiting nerve force, and thereby lowering the systemic resistance to a greater or less degree. In the former —*i. e.*, exposure to cold sea water—I have noticed the temperature lowered from 1° to 2°, and at the same time the lessening of the pulse rate from 15 to 20 beats.

Dr. Gibbony, an English authority, referring to the subject, states that in his observation "of flounder fishermen off the coast of Northern Ireland, and of the shrimp fishermen off the

coast of Brighton, England, where their vocation compels them to be exposed in the water for many hours," the temperature of these waters being at least 10° lower than that of the Atlantic Ocean along our coast, he has noted the pulse as many as thirty beats less than normal, and the temperature reduced $2\frac{1}{2}$°.

Hippocrates once advanced the theory "that the subsequent heat succeeding to the cold applied was always proportionate to the intensity of the latter." While this may be to some extent concurred in, it is subject, both in health and in disease, to special modifications, which modifications arise more particularly from the length of time of the exposure and the conditions under which the exposure is made. Therefore, when considering the special benefits or the special diseases and conditions to be benefited, there are other agencies or influences which must be taken into account, such as, for instance, those relative to the sea, namely, the forcible activity or movement of the water; the physical conditions of the strand; the distance and convenience of the dressing rooms, and those relating to the individual, namely, the resisting power of the body; the time of the bath; length of time of exposure; the temperament; the physical debility present—*i. e.*, whether the body is relaxed, enervated, nervous, or highly tensioned, and also whether the result to be obtained should be bracing, tonic, stimulating, and invigorating —in other words, the individual bather must be considered a complexity of forces or an aggregation of systems capable of independent as well as allied actions.

Beginning with a simple cell, with its inherent power, we can easily follow the force suggested until it expands into the various systems, chief of which are the nervous, the vascular, the glandular, and the muscular, each of which is easily influenced individually and collectively, incidentally and relatively, internally and externally.

Time does not permit of a further discussion upon this part of the subject. I therefore leave it with these mere allusions; but your own familiarity with the same has already impressed you with the importance of a subject so universally used, yet so thoughtlessly and slightingly considered.

Just here it may not be out of place for the sake of illustration to consider the human body as a type of a perfect machine, constructed in a beautiful and wonderful manner, with its functions so intimately poised, accurately organized, and so connected that none other could be more perfect. The deviation from this type must be represented by disease, either functional or organic, while the extent of the derangement represents only the degree.

Assuming this to be our perfect machine, our type necessarily will be a youth representing vigor and perfect development. In the immersion of such an individual in sea water at a temperature of 65° to 70° we would naturally find a quick response to the sudden stimulation of cold, that is, of the water, which meets the surface of the body as the plunge is taken. The stimulus to the peripheral sensory nervous system is such that it quickly contracts the adjacent capillaries and sends the blood speeding to the larger vessels and internal organs. The systemic vigor and reserve forces return it again to the surface of the body, accompanied by the resiliency and invigoration which emphasizes the pleasurable sensations so gratifying to the bather.

If, after dressing, from such a bath a genial glow suffuses itself over the sensitive surface of the body, a pleasing warmth internally succeeds, accompanied by a refreshed and invigorated feeling, it is evidence and proof of the salutary influences; but if, instead, there follow a chilliness, languor, headache, irresistible depression and disposition to drowsiness, or any of these, it should be reckoned as important evidence establishing the fact that the bath has not contributed in any material way to the advantage or improvement of the person's health, and that, if persisted in under similar or like conditions, the result will in time prove injurious. So much depends upon the vital power or reactory influences, which we may call the *callidum innatum*, which is constantly renewed by a most admirable combination of chemical agencies and animal functions, that, after considering the preliminary conditions previously stated, it becomes equally important for us to observe our patients—that is, the influence succeeding the baths—and impress upon them the necessity of looking for the

special reaction above stated, and when it is absent, to desist further indulgence in so questionable a pleasure.

With these generalities and allusions, I now come to speak more specifically of the use of the bath and the special conditions and diseases for which it may be used. In the first place, I venture to make the statement that the sea or ocean bath as practised in our city and other Atlantic seacoast resorts is responsible for greater harm than good. Few people seem to attach much importance to the danger of either the prolonged exposure in the water or to the prolonged exposure in their wet garments in the cool atmosphere on the sand. While this seems a matter of easy remedy, particularly if a little good judgment and common-sense be exercised; nevertheless, the surprise is that the practice increases rather than diminishes. It may be said in advocacy of such a practice that the majority of bathers bathe for pleasure, with a blind disregard for either its advantages or disadvantages, and indulge themselves to such periods of time as either their own or their friends' conveniences permit. Admitting the truth of this claim, there does not yet seem to be any good reason why the seeking of pleasure should be an apology for the violation of the laws of health; and too often the physical condition present, which already may have given them great concern, adds no alarm to the occasion. Many of us have stood by the strand and observed not a few but many, of all ages, young, middle aged, and old, alike, returning from the surf, or from a prolonged exposure in their wet clothing on the sand, to their dressing-rooms, slightly and even markedly cyanosed, with pale and shrivelled cutaneous surfaces, arterial capillaries contracted, cutaneous functions temporarily paralyzed, internal organs and deeper vascular system greatly engorged, and in some instances seriously disturbed, shivering and chattering as they pass, giving little thought to the threatening dangers incidental to the impaired forces and debility occasioned by the exposure.

In view of these observations, it would seem that our voices have already been too long still and our pens too inactive on the subject so universally abused. Each physician should counsel those over whom he has advisory charge, of the dangers incident

to a prolonged exposure in the ocean or on the sand in wet clothing, and also to the too frequent daily indulgence of either. It is his duty to impress upon them the advantages of a short exposure or immersion, say ten, fifteen, or twenty minutes, and never exceeding thirty minutes; the necessity of prompt and positive reaction after the bath; the maintaining of a good physical condition, and giving to them, according to their own particular debility, such specific instruction as will best avert harmful or serious disturbances. When the normal bodily temperature is exposed to that of an active body of water, or currents of air 10°, 30°, or 40° lower than itself, the tendency is to the equalization of the temperature of the bodies in contact, and the greater the motion of the bodies the more rapid the transfer and the more rapid the receipt and loss to the bodies involved; hence prolonged contact largely reduces the former, while it adds but little to the latter. The body during this large dissipation of heat becomes so enfeebled that its economic forces are temporarily inhibited and, in some instances, seriously deranged. While such general disturbances may be frequently observed in the healthy and normally robust, it much more frequently occurs in those of less resistance, therefore the necessity for greater precaution in giving advice and making recommendations to those whose health has already suffered impairment.

The practice of promenading the beach in the scant and poorly protecting garments, so fashionable of recent years—I pause to emphasize the word "fashionable"—after an immersion from, say, three-quarters to an hour in the surf, is unmistakably harmful and equally inexcusable, and should have the denunciation of every physician as well as others engaged in the upbuilding and maintenance of good health; and there is little less to be said in favor of the practice of lying on the sand and frequently returning to the water, which practice so changes the temperature of the body as to invite lowering resistance, and thus rapidly insures progressive debility.

An important feature in sea bathing which must not be lost sight of is the active motion of the water—*i. e.*, the impact of the swells or waves; to this may be added the thermic stimula-

tion of the cold, the chemical irritation of the salt, and the mechanical influence of the fenced activity, thus giving a marked nerve stimulation and an energetic primary vascular contraction and subsequent reaction. Hence, when summarily considered, we must recognize that a tremendous impetus is given the fluids of the body, an incidental active alteration in the various forces, also modifications direct and indirect to the reflex activities. The cold sea bath combines the stimulating influences of the brine bath at a low temperature, with the effect of a stimulating hydrotherapy procedure. They are *admirable for rapid reaction* and prompt functional stimulation, and are indicated in those weakened conditions where normal metabolism is inhibited or perverted nutrition exists. Such conditions are present usually in all functional disturbances of some standing, a type of which is neurotic dyspepsias; anæmias; functional neuralgias; neurasthenia; some cutaneous diseases, as eczema in subacute and chronic form, etc.

Sea bathing is contraindicated in those cases in which the arterial elasticity for any reason has been changed or lost, as in arteriosclerosis and capillary fibroses; and when the peripheral vessels have ceased to respond to reflex stimuli, or in any case or condition when the stimulation of the bath would be likely to favor or produce internal hemorrhage, particularly in the aged, in whom we have realized or suspected fragile arteries, and for those with organic heart disease, recent rheumatism, cholelithiasis, or any acute gastrointestinal or febrile diseases.

THE DELIRIUM NOTICED IN CARDIAC DISEASE.

By ROLAND G. CURTIN, M.D.,
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Whether or not there is a passing delirium occurring in the later stage of diseases of the heart, and whether it is peculiar to this condition, I find it hard to determine from a study of the literature that has been at my disposal. Cases of insanity associated with heart disease have been carefully and closely studied, but it is to an altogether different condition that I desire to call your attention. The great difficulty in studying and classifying the symptoms of advanced heart disease is that it is often hard to sharply separate the symptoms depending on the primary condition from those of the commonly associated complications.

In the histories here recorded I have made every effort to eliminate all other diseases, such as hysteria, fever, Bright's disease, rheumatism, pneumonia or pleural trouble, jaundice, blood dyscrasia, chronic alcoholism, or anything else which might possibly be a cause of permanent or transitory delirium.

These cases are quite rare, so that a long time has been required to select a sufficient number to enable me to arrive at any reasonable conclusions. These cases will be given, only mentioning the salient points, in the hope that they may assist in determining the cause of the delirium. I have seen a great many cases of heart disease in my practice, but have not found more than four in which it was associated with continual insanity.

E. Regis, in his *Practical Manual of Mental Medicine*, a book that is highly esteemed by neurologists, says, under the heading of Cardiac Insanity:

"Affections of the heart have, rather frequently, an injurious effect on the mind, and are capable of producing various disorders

of the ideas and the emotions, from simple change of character and rudimentary morbid conceptions to confirmed insanity.

"Nevertheless, since it is hardly possible to point out exactly what cerebral circulatory disorders are produced in cardiac disease, and since, on the other hand, the disorders of the circulation that are constant as symptoms of the heart lesions are far from causing delusional or versatile symptoms in all cases, we must recognize that the nervous system is a potent agent, if not the principal one, in the production of cardiac insanity, and this permits us to continue to consider this variety of alienation as a sympathetic insanity in the wider sense we have given to the term.

"All diseases of the heart may produce mental alienation; but those whose action in this way seems most frequent are mitral and aortic lesions. The lesions of the other cardiac orifices may, nevertheless, have a certain role; and M. Duplaix has reported in *L'Encephale* a case of insanity, witha gitation, hallucinations of sight and hearing, and ideas of persecution, that was plainly connected with a tricuspid insufficiency.

"Cardiac insanity takes on most frequently the melancholic form, at least in the case of mitral affections; as, according to certain authors, and especially M. d'Astros, who has supported this view, the aortic cases are those of the excited types, and the mitral ones the depressed; so that the former tend rather to mania in all forms, and the latter to melancholia."

"The mental disorders that sometimes accompany the later stages of asystole have not been mentioned. In these cases we do not have a real insanity, but a sort of toxic delirium analogous to that of the last stages of phthisis.

"In a recent clinical lecture (*Bulletin médicale*, March, 1891) M. Huchard has shown that true cardiac insanity, which he distinguishes according as it occurs, with or without asystole, is comparatively rare, and that it is of importance not to confound it with certain deliriums that occur in patients with cardiac disease, such as cardiorenal delirium (due at once to asystole and uræmia); the drug deliriums (digitalis, belladonna, etc.) are the arthritis, alcoholic, hysterical, and puerperal deliriums. These various

forms have, besides, a physiognomy of their own that allows them to be recognized with proper attention."

We have certain nervous symptoms associated with heart disease—apoplexy, epileptiform convulsions, impaired intelligence, tremors, headache, nervousness, vertigo, loss of memory, fear, sleeplessness, syncope, chorea, and paralysis. With all these disturbances it would seem that the nervous system is sufficiently affected to take upon itself at least a mild delirium. In *Diseases of the Heart*, by Dr. Sanson, of London, he says :

"The cerebral phenomena observed in heart disease may, for the most part, be divided into three classes. The first embraces those due to chronic disturbance of balance between the arterial and venous systems, which is the result of imperfection of the driving power in the great engine of the circulation. The brain may suffer from a deficient supply of arterial blood, from excess of venous blood, or from these causes variously combined. Arising from these conditions there may be increase of the fluids effused within the intracranial cavities, and degeneration of the brain tissue, owing to the impaired nutrition."

The cases of insanity associated with heart disease that have been studied by neurologists seem to have been largely, at least, cases with good compensation and without heart symptoms. The altered circulation might, in some cases, predispose the patient to insanity. They would not be in the same class as those here reported, where the patients were in the "slough of despond" by reason of the heart's weakness. Some of the factors that might be assigned as a cause of the delirium are :

1. Carbon dioxide.
2. Faulty metabolism.
3. Arterial congestion.
4. Venous congestion.
5. Capillary congestion.
6. Œdema of the brain.
7. Anæmia of the brain.
8. Strain on the nervous system from insomnia and constant struggle for breath.
9. Dread of death.

The longer I study such cases the more I am inclined to think the delirium is unlike that of other exhausting diseases. Since we do not find the same symptoms in those conditions associated with anasarca or œdema of the brain, I feel sure that the cause is a nervous irritability of the brain from some toxin rather than an œdematous or anæmic condition.

Tabulation of Heart Cases with Delirium. The salient points only in each history are given.

Case I.—A. T., male, aged forty-eight years, with dilatation of the right and left heart, with marked dropsy, wandered out of the room when left alone. Talked to imaginary persons; insisted on going to business.

Case II.—T. W. C., aged forty-three years. Systolic, aortic, and mitral disease; dropsical. Wandered all over the house. Went up and down stairs. When alone threatened to kill himself by shooting or jumping out of the window. Marked dyspnœa and dropsy. Annoyed by real sounds. When he got out of bed he was bewildered and said I wanted to send him to a hospital, so that I should not have to sign a death certificate.

Case III.—J. C., aged twenty-four years. Double mitral disease without dropsy. Would get nervous and hysterical. Afraid to go any distance from home. The morgue was a quarter of a square from his house. He would go there and stay, and talk about the unpleasant sight with glee. Kept his room almost all the time for a year. Was suspicious and irritable, and avoided observation.

Case IV.—J. H., aged fifty-five years. Dilatation and myocarditis. Threatened to kill himself. Awakened to find his bed on fire. Feet were supposed to be electrified, and sometimes his arms. Muttering and disgruntled. Wanted to go to work. Dropsy.

Case V.—Mrs. S., aged thirty-two years. Mitral systolic murmur. Dropsy. Thought that there was an electric connection between her bed and the police station, and that if she moved the police would pounce down upon her and arrest her. Day after day she lay quiet, fearing to move in bed.

Case VI.—Mr. C., aged sixty-four years. Mitral systolic murmur, markedly œdematous. Thought the family were mak-

ing a brothel of his home. Sorrowful, but not vindictive. Imaginary company in his room.

Case VII.—L. J., aged fifty-seven years. Mitral systolic disease and dilatation. Myocarditis. Anasarca. Awoke to find the pillows of his bed on fire. Rambled incoherently all the time. Reported imaginary grave opinions in regard to his case. This was the only case in the group that recovered.

Case VIII.—M. G., female, aged sixty-two years, with mitral disease and dilatation and water-logged. Was afraid she would die. Imagined she went up town and would relate a supposed conversation she had with people she met, and tell of numerous purchases she had made.

Case IX.—P. R., a policeman, aged forty-eight years, with dilatation; little œdema. Would leave the house and stay all night in a bar-room, seemingly for company. He was not a drinking man.

Case X.—J. W., male, aged forty-five years, with double aortic disease. Mild delirium when awakening from sleep. Easily roused.

Case XI.—F. D., female, aged sixty-four years, with an aortic systolic murmur and incompetency. Marked œdema. Mind constantly troubled. Was away from home. Conversed with imaginary persons.

Case XII.—J. L., male, aged sixty-five years. Dilatation, with a systolic mitral murmur. Extreme dropsy. No idea of time. Spat medicine and food on bed and wife, and despised the minister who called on him, and anyone, except the family, was supposed to be the minister. Rambling all the time, but worse at night. Would stop short in the middle of a sentence.

Conclusions. 1. It seems to me that the delirium of the last stage of heart disease differs materially from that of the same stage of phthisis, cancer, pernicious anæmia, or any other exhausting disease with or without anæmia. Three out of the twelve patients threatened to commit suicide, which is very unlike the symptoms in the diseases named. The patient is apt to be melancholy, while in phthisis, etc., the patients are usually hopeful to the last.

2. The delirium is almost always after sleeping.

3. Easily aroused from the delirious state to one of normal mental activity.

4. Muttering delirium is the most constant.

5. The activity of the delirium seems to bear a direct relation to the blood supply to the brain. The cases in which the heart was weak and the blood was impoverished and the brain œdematous and congested the delirium was low muttering, when, on the other hand, the brain was stimulated with a good supply of blood from a strong hypertrophied heart it was surprising to see the mental activity.

6. The symptoms were quite acute and active in cases unassociated with dropsy and great weakness, but much less so in cases with anasarca.

7. The fact that three patients had hallucinations connected with electricity made it occur to me that the numbness incident to the disease from continued pressure of nerves by bed or chair, or the pressure from the watery accumulation under the skin, might have suggested the thought.

8. The persons advanced in life seem to be more often affected than those who are younger.

9. Changes or interruption of medicines does not seem to influence the delirium, and all cases were not treated with the same drugs.

10. The presence of delirium in heart disease is a very grave symptom, as shown by the fact that only one patient in twelve rallied so as to be able to go about again.

I have often been struck with the mental ability of some of those whose lives have been dwarfed by congenital heart disease.

The body is crippled, but the brain is capable of doing good work. So far as my observations go, this is not true of heart cases suffering from acquired endocardial disease.

DISCUSSION.

Dr. R. H. Babcock: The paper is one of very great interest and importance. The literature of this subject is exceedingly scanty. The association of heart disease with insanity and the occurrence of certain emotional disturbances in the course of heart disease have been frequently alluded to in literature, but delirium proper in the course of cardiac disease is scarcely at all mentioned. I have had the literature of this subject looked up back to 1810, and in the current literature there are only three articles bearing on the subject of delirium in heart disease. The first of these was by Riegel, whose paper is found in the *Transactions of the Congress Heilkunde*, held at Giessen, published in 1879. Riegel confined his remarks to that form of delirium which is encountered in cardiac disease in the stage of incompetency—inadequacy—and in which the delirium appears as toxæmic and due to the administration of drugs in the attempt to remove the dropsies and other symptoms incident to the cardiac inadequacy. He calls attention to the fact that in addition to the delirium the patients may pass into a state of collapse from which they may not recover. The second paper bearing on this subject was entitled "Toxæmic Delirium of Heart Disease," published by Eichhorst in the *Zeitschrift für klinische Medizin*, in 1898. Eichhorst calls attention to mental disturbances in certain cases of mild cardiac disease which enter the hospital in a state of broken compensation and of dropsy. During the attempt to relieve the dropsy by means of digitalis and diuretin delirium developed, which was either active or of a low, muttering kind, and was preceded by somnolence. As the dropsy disappeared the patients became rational and returned to their normal mental state, with relief of the dropsy. Eichhorst believed these symptoms were due to the absorption of toxins incident to the removal of the œdema, and that they were not due to drugs, since these were not administered in sufficient doses to produce such effects, and did not produce like effects in other patients.

The third paper I found was published by Telgmann, of Hildesheim, and appeared in the *Zeitschrift für klinische Medizin*, in 1899. He narrates five cases of heart disease in which delirium developed. The patients were not in a state of profound cardiac inadequacy with dropsy, but manifested symptoms of more or less cardiac incompetence. In three there were complications, as albuminuria; the delirium was of an active kind in all, I believe, the patients gesticulating violently, and even destroyed articles in the room, and in the endeavor to escape from the room; since their delirium took the form of the belief that they were not at home, that they were in strange surroundings, and must endeavor to return to their homes. Telgmann offers no explanation

of this delirium; he says that in several instances it came on after fatigue, but was not due or incident to the administration of drugs, and he offers it simply as a contribution to this subject of delirium in heart disease.

We have all probably met with cases of delirium occurring in the course of cardiac incompetency—broken compensation. I have never given that subject any special thought, but I have this last winter seen two patients in whom this symptom developed. One was a case of mitral insufficiency, with chronic fibrous mediastinopericarditis, with dropsy, and during the administration of large doses of diuretin for the purpose of carrying off the dropsy this patient became delirious, his delirium manifesting itself at night. The second was an elderly man, with chronic myocarditis, the vascular form of aortic regurgitation, and chronic interstitial nephritis. This man, when dropsical and the œdema was being removed by proper remedies, became mildly delirious, not recognizing objects in the room, talking about business, and mistaking a picture in the room for a powerful Irishman who wanted to get into the bed and turn him out. He frequently said he could breathe if he could start his breathing first before that big Irishman in the corner did. It was a singular form of delusion. In both these instances I am inclined to attribute the mental disturbance to the effect of toxins, although it is conceivable that some degree of cerebral œdema might be responsible for the condition. I think it is one of great importance which we should study with a view to more definite facts concerning this symptom, since it appears to be a very important one. One of my patients recovered, the other did not.

Dr. Beverley Robinson said that whenever we consider a case of chronic heart disorder we are necessarily obliged also to consider all the secondary conditions connected therewith. We all know that in those cases where there is œdema, where there is a marked aortic regurgitation or mitral regurgitation, or dilatation of the heart, we usually find changes in the kidneys, or occasionally in the arteries of the brain; we find a certain stage of interstitial nephritis in all old conditions of heart disease.

Dr. Robinson does not believe that we should explain delirious conditions in heart disease by any one particular cause. We have a combination of causes: sometimes it is a case of faulty metabolism, not connected with the heart particularly, and all the conditions concomitant therewith.

Dr. Robinson spoke of certain phases of so-called neurotic heart to which some German observers have lately directed attention. These cases are seen mainly outside of hospitals and in private practice. We find a certain number of individuals whom, to sum up, we regard as neurasthenic. We should not treat them, if men, as of the hysterical type in women. Undoubtedly, in many of these instances there is no previous history—there is nothing in the examination which we can make that makes us fully un-

derstand whether these be organic heart changes except that we certainly do find an occasional diastolic bruit, occasionally a low percentage of hæmoglobin and a low specific gravity of urine. They are anæmic. Such cases, I say, of neurotic origin, may be relieved by judicious treatment after a time.

Dr. Delancey Rochester: Just two points I want to make. In the first place, to reiterate what Dr. Robinson has said in regard to the fact that we seldom have disease of the heart without other disease existing elsewhere in the body, and there is almost invariably a toxic element present in those circumstances.

The second point which ought to be taken into consideration, whenever we consider delirium associated with diseases of the heart, is in connection with diuretin, which Dr. Babcock referred to. I saw two cases this winter in which there was apparently no disease of the kidney, but where there was pronounced cardiac disease, cardiac dilatation resulting from overstrain on top of a previously existing mitral lesion, œdema, and ascites. I used diuretin to relieve the œdema, and in turn a pronounced delirium followed the use of diuretin.

Diuretin or any stimulating diuretic is, in my opinion, contraindicated in any case of cardiac disease associated with which there is existing disease of the kidney. For the relief of œdema we should rely upon the sweating apparatus rather than upon stimulating the kidney, but in these two cases there was apparently no disease of the kidney. The urine was perfectly normal; but, still following the use of diuretin, delirium resulted in quite a pronounced degree. Whether this particular drug has a poisonous effect I do not know, but it was interesting to me when Dr. Robinson mentioned that delirium had occurred during the use of diuretin.

(In answer to the question from Dr. Babcock as to what dose of diuretin Dr. Rochester used, the latter replied, "One gram four times a day.")

Dr. Jacobi: There are many heart diseases, but very few such cases; so it is not in the heart disease alone that the cause must be looked after. There must be an abnormal or a predisposing condition of the brain itself—either an abnormal circulation or an abnormal brain. We have heard that it is principally aortic anomalies in which Dr. Curtin's cases are met with.

The disease of the aortic valves would give rise to anæmia. We have been told that such attacks of delirium will come on after sleeping. Now, during sleep there is either an increased anæmia (which is normal) or in consequence of the recumbent position there may be, in predisposed brains, and on account of circulatory disturbances, an hyperæmia. Thus it is not exclusively the heart disease, as such, that gives rise to these conditions of delirium of insanity, but it is the condition of the brain resulting therefrom or complicating the heart disease. I have seen a case of insanity (one of the first I have

seen of that kind) that was complicated with, as far as I know, absolutely nothing else, as the final result showed.

There was a man of thirty odd years, in the interior of the State, who had to be sent to the lunatic asylum. I did not find anything in him except an hypertrophied and dilated heart and an old mitral incompetency. He was in the lunatic asylum perhaps six months; very probably he had more rest there than he had outside; and he came home "cured" of his insanity. Our lunatics are getting cured ever so many times, and readmitted and statistically cured again. He was not a drinking man and he was not syphilitic; but got worse in the course of a few years; and every time he got worse he was sent to the lunatic asylum, was kept quiet in bed, and during that time got well. Finally, the compensation advanced to such an extent that he at last advanced to a responsible position in the interior of the State of New York. There he is yet. He has his heart disease, certainly, but with good compensation, and he has not been in the lunatic asylum these ten or twelve years, I think.

Heart disease has surely a powerful influence on the circulation and on the nutrition of the brain, but I have always looked for concomitant or predisposing conditions. In one case I found a history of syphilis in a young boy, aged fifteen or sixteen years, with a moderate mitral incompetency. When he had been submitted to an antisyphilitic treatment for a period he got comparatively better, as far as I know during the treatment, because his syphilis got well. The majority of the few cases that I have seen were adolescents, not persons in advanced age, ranging from fifteen to seventeen and eighteen years of age. We know that the disposition to mental disturbance is very great about and after puberty; in fact, the heart disease in every case, I believe, was a mitral incompetency sufficient to be the proximate cause of the delirium. I do not think that I have seen many cases, but the majority that I have seen were about that age.

Dr. James M. Anders: I regard this paper as being both timely and of great practical importance. Dr. Curtin has made a valuable contribution to the symptom delirium in heart disease, especially for the reason that he has given us his own careful and extended observations. It has not been my good fortune to meet with as many cases as he has reported, although my personal experience embraces a number of instances which I can readily recall; and with one or two exceptions they arose during the period of failure of compensation (or apparently so) in chronic cardiac diseases.

After the tricuspid valve becomes incompetent, as we know, the heart and the lungs no longer bear the entire brunt of the cardiac lesions, but now every organ of the body shares in the work of carrying the burden. We have venous congestion—increased pressure in the venous side of the circulation—and the point, it seems to me, that we ought to remember in this connection is that this

is a distinctly pathological condition. It means starvation of tissue throughout the entire body; it means accumulation of waste products in every organ in the body; it also implies distinct tissue alterations or changes in the various organs of the body, including, naturally, the brain. Now, other considerations, it seems to me, enable us to understand why we should have disturbance of the function of the brain in these cases, just as we have disturbance of the function of the liver, of the gastrointestinal tract, the kidneys, and other important organs of the body. This is the explanation, I feel quite sure, of most cases of delirium that sometimes arise in the course of chronic valvular disease.

Now, there is one other causative factor often lost sight of, and that is the altered blood changes, and to this point Dr. Jacobi made reference. Under these circumstances a general arteriosclerosis and fibrosis of the viscera are engendered. Now, in these cases (and they do occur sometimes) delirium may develop before any evidence of failure of compensation exists. The delirium in these cases, however, is not attributable to the heart condition and not to the effects of venous hypertension, but to the morbid changes presented by the brain, which changes, like those presented by the heart and bloodvessels, are dependent upon one and the same cause—blood changes.

Dr. Curtin: In answer to Dr. Robinson's query as to any associated kidney disease, I would state that that element was excluded as far as possible. There was no albuminuria in the cases at the time the observations were made. I have seen quite a number of cases in which there was a slight amount of albumin in the urine, and in which there was delirium, but I did not report cases in which the kidneys seemed to be a factor.

In regard to the question raised, that diuretin might have been the cause of the delirium, I would state that only four of the cases reported were treated with diuretin, and that the one patient that recovered was placed upon that drug with quite marked results, the delirium rapidly ceasing under its use. I have used this drug extensively during the last ten years, and have never suspected it as a cause of delirium or of any other nervous manifestation.

THE MECHANICAL TREATMENT OF ORGANIC HEART DISEASE.

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In 1892 I had the honor of presenting to this Association, upon the occasion of my election to membership, a demonstration of the relations of pneumatic differentiation to the several forms of pulmonary disease. In the fall of that year circumstances led to a thorough consideration of the cabinet forces in special relation to the pathic conditions of cardiac disease, which resulted in a convincing demonstration that in pneumatic differentiation we have the nearest approach to an ideal treatment of organic heart disease at present known to medical science. It is an abstract of that demonstration which I desire to present to you at this time, in brief outline and familiar form, reserving the right to fall back upon an article published in the *Journal of the American Medical Association* of March 15, 1902, for technical accuracy of statement under criticism.

This demonstration is based upon the following fundamental propositions :

1. The first pathic effect of every cardiac lesion is either weakening of muscular power or an increase of blood tension in some one, and decrease in an associated vascular cavity.

2. The ultimate destructive effect of all cardiac lesions is the development of a vascular tension in excess of the compensating muscular power, whether it be attended by increase or decrease of both, or by increase of one and decrease of the other. Whatever the line of change, death comes through a disturbance in this ratio between tension and power.

3. The results of this change are: slowing of circulation, with consequent tissue malnutrition; hence reflex arterial contraction to hasten circulation, with consequent increase of the already pathic tension and a resultant augmented strain of the circulatory organs, whereby the circle of mutually causative lesions is made complete, that eventually results in tissue degeneration and death. Or, in very simple terms, defective power and excessive tension are the factors of death in cardiac disease.

4. In view of these physical facts, and our present inability to repair cardiac lesions, the ideal treatment of organic cardiac disease is found in that agent which will supply circulatory force and reduce vascular tension in such degree as will allow the nutritive repair to keep pace with force demands. That is, that will carry on the circulation for the heart and relieve the destructive tissue strain while the heart rests and recuperates. It can be and has been absolutely demonstrated by physical methods that this is precisely what is accomplished by pneumatic differentiation, and the demonstration backed up by clinical results of many years' duration.

The physics of pneumatic differentiation and the relations of its forces to pathic cardiac conditions will, perhaps, be more clearly and readily understood if we consider their application to a specific lesion; and I choose aortic insufficiency as the one which is the most disheartening under ordinary methods of treatment, but to which pneumatic differentiation is most perfectly applicable.

Given an aortic reflux and the pathic effects and results are, in order, as follows: increase of ventricular and decrease of arterial diastolic pressure—results, ventricular stretching and eccentric hypertrophy; slowing of circulation and consequent reflex arterial contraction to restore tension—secondary results, increase of aortic reflux, hypertrophy, and a repetition of the same vicious circle of changes. This process continues, maintaining a reasonable circulation, until the systolic arterial and the diastolic ventricular tension reach a point where tissue nutrition fails; the ventricle and arteries continue to stretch, but not to hypertrophy, and at this point begins the systemic march to the grave.

In what way, now, is pneumatic differentiation applicable for the relief of these conditions when present; for their arrest or prevention when developing or foreseen? In considering the demonstration which I have to offer, I beg that you will keep carefully in mind the fact that the break in the conditions outlined came, as it does in all cardiac disease, at the point where vascular tension was in excess of possible force expenditure on the part of the ventricle, and that, therefore, a reduction of diastolic tension with an increase of propulsive force means restoration of circulatory equilibrium.

I say it with shame, for it seems to reflect upon my powers of exposition, yet I say it for the sake of truth, that I have yet to find a dozen physicians who seem to appreciate what is meant by pneumatic differentiation. The pneumatic cabinet seems to stand simply as the equivalent of altitude, and its action as merely the taking off of pressure. I am not surprised that it seems a very unimportant affair to those whose knowledge is thus limited and inaccurate. If that were their only action, cabinets should not sell for over a dollar a dozen. Let me try once more to show what is meant by pneumatic differentiation; what its effects are upon the circulation, and, therefore, what its therapeutic value is, not only in cardiac but many other conditions. Pneumatic differentiation means a differential atmospheric pressure; a different pressure on the pulmonary circulation from that on the general circulation. As applied in the pneumatic cabinet it means the development of such a differential pressure in favor of the general circulation during inspiration, and the reversal of this differential in favor of the pulmonary circulation during expiration—that is, the pressure on the skin is less than that on the lung during inspiration, and less on the lung than skin during expiration. All of which amounts to this, that an atmospheric suction force is applied to the skin during one-half of respiration and to the lungs during the other half. It is accomplished in this way: A patient is placed in the cabinet and his lungs connected with the outside air by a tube. It is evident that if, as he inspires, the air of the cabinet is rarefied his pulmonary circulation will be under barometric pressure, and the general circula-

tion under a lower pressure, and that this is the equivalent of having the entire systemic circulation under one huge dry cup. The effect upon this circulation is identical, in character, with the local effect of a dry cup; the capillaries are dilated, the blood flows more easily and is sucked out of the arteries into the veins, with the effect of reducing the diastolic tension primarily; the force which, as we have seen, is the determining factor of the reflux, and hence of evil in the case under consideration. Here, then, at the outset, is the specified ideal measure which reduces tension actually and force relatively.

Now, if these conditions of differential pressure were to be made permanent, the effects would again be the same in character and equally injurious as when a dry cup is allowed to remain in action over a few seconds; the capillaries would become engorged, the arteries would contract in response to the lowered tension, and very soon the previous conditions of tension would be restored, with an engorged venous system and a slowed circulation. But if, on the contrary, this differential be held only during a slow, quiet, deep inspiration, and for a second or two after its completion, the effect is merely a mild arterial depletion with equivalent reduction of diastolic and systolic tension and simple venous fulness. At this point the patient drops the tube from his mouth, and instantly his pulmonary pressure drops from barometric to that in the cabinet—say, one pound to the square inch. It is just here that so many fail to follow the demonstration, and are unable to see how conditions of equal atmospheric pressure on both the pulmonary and general circulations are equivalent to a differential in favor of the lung. The explanation is to be found in the fact that the vascular effects of a general reduction of atmospheric pressure are greater in the pulmonary circulation by reason of its relatively weaker anatomical supports. Everyone knows that a reduction of several inches of mercury in the general pressure, such as is found at elevations of 10,000 to 12,000 feet, will draw the blood from the brain and cord and the cutaneous surface and cause extreme pulmonary hyperæmia, even to the point, at times, of causing vascular rupture. Yet, although this pulmonary suction effect of reduced pressures is clearly

recognized in the extreme, the absolutely identical action of rarefactions of one and two inches of mercury is ignored and denied solely because its milder degree does not result in obtrusive symptoms. That it is present, however, in cabinet action cannot be questioned, for it can be made grossly evident to the eye. Hence, as the patient in the cabinet at the end of his full inspiration, with depleted arteries and full venous system, drops the tube from his mouth, the atmospheric differential is instantly reversed in favor of the lung, and the blood is drawn from the veins under low tension into the pulmonary vessels until they, in turn, become mildly hyperæmic. Thus the differential and circulatory cycle is complete; the blood has been hastened in its flow; diastolic and systolic arterial tension have been reduced; the aortic reflux has been diminished, and the demand upon the ventricles for force expenditure has been lessened; while the heart muscle, freed from overstrain, has had opportunity to contract fully and regain its tonicity. In other words, the ideal relief has been afforded a crippled and overtaxed heart, and there is no therapeutic measure in the whole realm of medicine which gives more brilliant results than does pneumatic differentiation in aortic reflux. No patient suffering from that lesion can take a dozen such breaths and not be conscious of relief. But, to continue the process a step farther and begin a second respiratory cycle. We left the patient in the rarefied air of the cabinet with vascular conditions, those of mild pulmonary hyperæmia. This is never sufficient, under the rarefactions employed, to cause any conscious increase of dyspnœa, even when that is severe. It is to be observed also that the rarefaction is still acting upon the systemic vessels, as well as the pulmonary, whereby reduction of arterial tension is held constant, even if less than during the differential conditions of inspiration. But the patient remains thus only long enough to take a full inspiration from the rarefied air of the cabinet, giving time for the full effect of the pulmonary differentiation, and then again takes the breathing tube in his mouth. As the cock is opened and barometric pressure restored to the lung, the original differential relations are again established, and the lungs are again depleted by suction of the blood into and

through the heart and vessels to the veins. It is to be noted that this restoration of pulmonary pressure is only barometric, and hence does not throw any strain upon the right heart; it is a compression in a sense, but only normal, and yet greater than that upon the systemic vessels. Moreover, this relatively higher pressure is applied through the lungs to the outside of the heart, so that the right heart has support equal to the pressure on the circulation which it carries; while the left heart is practically compressed compared with its circulation. This differential pressure is such that the blood is practically sucked out of the left heart without muscular effort. Indeed, it is possible at times to demonstrate by the sphygmograph a total abolition of diastolic tension by this process, with an augmented blood flow—the conditions previously defined as representing the ideal therapeutic results.

The relations of this process to other forms of heart disease are readily deduced from the foregoing. In mitral regurgitation the effect is often as immediate and definite, but less in degree and duration, since the extent and permanency of results must depend upon the compensating tissue. In mitral reflux this is essentially the lungs, in which resistance cannot be developed as in the ventricle.

My experience with aortic obstruction has been almost entirely in elderly patients, where the lesion was part of the changes of age. In this class of patients the results almost equal those in aortic reflux. With mitral obstruction something may be done to afford relief by one who is perfectly familiar with the cabinet, but a novice will do well to leave this lesion alone. It requires a different form of differentiation from that detailed above. In cases of angina, however, whether from changes in the coronary or systemic vessels, and in all forms of myocardial degeneration and weakness, the cabinet is "facile princeps" in the rapidity and permanency of the relief afforded.

Some of those critics who "speak before they think" have uttered most impressive warnings against the danger of producing rupture and paralysis in cases of arterial degeneration. There is no such danger, however; for rupture, should it occur, could only be in a peripheral, not a cerebral, vessel; since the brain and

cord are so protected by their bony envelope that pneumatic differentiation produces cerebral anæmia, not hyperæmia. Indeed, this effect is at times, with anæmic patients, a hindrance to the application of the treatment for the relief of the cardiac and circulatory disturbances of old age, for which it is otherwise invaluable. It has not been my fortune to find anything which can compare with the cabinet for the relief of the weariness, nocturnal wakefulness, and afternoon sleepiness, so characteristic of the cardiac failure of advancing years. It is not claimed, of course, that pneumatic differentiation has any effect upon the arterial changes once developed, but simply that when the circulation is slowed and the heart weakened by reason of such changes the cabinet affords more relief than any other measure at our command, by reason of its control of the circulation. The arterial tension of chronic renal diseases is, in the earlier stages at least, largely due to arterial spasm, developed for the purpose of hastening circulation, and is very definitely relieved in many cases by the improved nutrition and excretion that are among the results of pneumatic treatment.

I have not burdened this paper with the clinical evidence of reported cases, as that can be found in the paper referred to earlier. I desire this paper to stand upon the basis of the physical demonstration and personal authority.

DISCUSSION.

Dr. Sewall: It seems to me that in this, as in so many medical subjects, we have got to depend upon empiricism for our conceptions. I would like to know if Dr. Quimby has carried out experimental work to justify his claim of the increased hyperæmia of the lungs with the inspiration under greater relative intrapulmonary pressure? I think that it is very important that not one thing be taken for granted in establishing the physical basis for our conceptions in climatology; and I do not see that the physical explanation of the happy clinical results follows *a priori*. I am asking for information simply, and would desire to know if experimental work has been done in this direction; I do not know of any such myself. Ordinarily we decrease, of course, the

tension within the lungs at inspiration, and we know that the blood flows there in a greater stream. In Dr. Quimby's cabinet there is increase of intra-pulmonary tension, I take it, with inspiration, as in blowing up the lungs by a bellows, so that the conditions are somewhat reversed. This is so vastly important a subject that I trust not one assumption will be made to explain the results unless it is on an experimental foundation.

Dr. Quimby: I hardly know how to reply to Dr. Sewall. I have used the cabinet for twenty years, and have been treating heart cases for twelve years, yet when he asks for proof that it may cause pulmonary hyperæmia I must confess that I have never undertaken experiments to prove it, for they are not required. We know very well that there is a point in altitude—*i. e.*, of atmospheric rarefaction—which produces very definite pulmonary hyperæmia, and the same changes will be started by one or two inches of rarefaction that are manifested grossly at high altitudes. What he states in reference to the circulatory changes under differentiation, that blood is driven out of the lungs during inspiration and drawn in during expiration, is entirely correct.

IS MILK A FACTOR IN THE SPREAD OF TUBERCULOSIS?

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For years the question of milk infection has been before us in its many and varied phases. With all that has been written and spoken, with so much creditable investigation, with the abundance of material to draw from, it would seem that we should be able to fix upon a definite opinion as to whether milk is or is not a factor to be reckoned with. But the real trouble with the investigation of such a subtle disease as tuberculosis is that our mental aspects are different, and we look upon the same objective phenomena from opposite viewpoints. Here one hypertheoretical mind draws out before our eyes the word-pictures in beautiful colorings, wherein he shows us cellular retrogression and susceptibility, heredity and predisposition, weather statistics and altitudes, darkness and dampness, and a score of other theories too finely drawn for ordinary mortals. Or, again, we have the scientist working constantly with bacillus and section, who in time, sooner or later, has the horizon of his mental vision narrowed to the microscopic field. Or, still again, we have the best class of the three, the sociophthisiologist, the big-hearted fellow who sees all our ills in the squalor of the tenements, and lays the odium of the spread of tuberculosis entirely to this fault in our social life.

Each of the contestants is partly right and partly wrong, but the best we can say is that their views only have remote bearing upon the subject. We want a common ground, something definite, tangible, full of common-sense, and freed from the obscurity

of words. Tuberculosis possesses a definite pathogenicity, and its method of spread and the manner of its onset follow well-defined paths.

We are all honest in wishing to find the common cause of the spread of this disease, and we would come nearer to the truth if we allowed our minds to digest every phase of the question instead of mounting upon a hobby-horse and tilting only in the direction of the things we would like to prove. There is hardly a man in America who, for personal reasons, would not like to believe Ravenel and Salmon right in their contention against Koch, but still pride in our own countrymen must not stay one's judgment or belief.

Koch was substantially correct in his claim, though he made rather too positive a statement that cattle could not be infected with tubercle bacilli of human origin, and Ravenel has utterly disproved this ; however, the mere fact that Koch was probably only technically wrong need not of necessity mean that he was wholly wrong. The casual reader who is not trained in experimental medicine is easily influenced from one dictum to another, as the balance turns to Koch and back to Ravenel, ever up and down, and seemingly no nearer solution.

There is not the slightest doubt that nearly all animals can be made to develop well-defined lesions from the human bacillus, but it is claimed that it is not a common occurrence, one happening with enough regularity to justify us in noticing it clinically as a causative factor. In like manner it is admitted that reasoning from the same analogy the human species might be made to develop the disease from bacilli of animal origin.

For clinical purposes and for means of prevention these accidental and possible diversions of the bovine bacillus to man or the human bacillus to bovines cannot receive serious consideration.

We must broaden our field of vision and look about for the common method by which man is infected, and one should stand ready to reject the occasional and accidental, for they are not worthy of our serious thoughts.

Tuberculosis is a contact disease, one in which the animal receives the dosage of infection from some other animal of its

kind, or an animal in the same class of susceptibility. For example, we know that an infected cow infects her own food-box and the food-box of her neighbors, and so on throughout the herd. For clinical purposes, then, the cow gets her infection from another cow, and no one contends that, commonly speaking, bovine tuberculosis is spread otherwise. It is acknowledged that swine tuberculosis is commonly from feeding tuberculous milk or offal from infected bovines ; and in avian tuberculosis the disease is spread from one fowl to another through infected dejecta. Accepting all this, it leaves the question of milk infection to man unsettled.

Whatever is the medium of infection to one nation or one race of people, we must naturally presume that the medium would be the same to all other people, that is, at least a fair postulate, and, if we use it in our arguments, it must apply strictly to all classes of society. If it be milk for the poor, it must be milk for the rich ; if it be milk for the American and European, it must be milk for the Chinaman, the Hindoo, the Japanese, the Alaskan Indian. No amount of twisting controversial eloquence is going to change this phase of the subject, for common-sense will dictate that the Chinaman gets his infection in exactly the same way as you or I do. Here we can stand on common ground, for the facts are plain, the logic seemingly sound, the deductions reasonable. And, even granting that the infection among our own people is by milk, let us see whither this line of reasoning would lead us. The sociophthisiologist points with unerring finger to the fact that it is the poor who live in squalor in whom the disease gains a devastating foothold. The man with milk proclivities would say that because of the lowered vitality the victim succumbs to infection from tuberculous milk. A little investigation ought to set this aside for the reason that the very poor use comparatively little milk and that the better classes do use it in enormous quantities. In the poorer classes the young adult seldom drinks milk, and among sailors who have had the disease I have made a special point to ask if they used milk, and the vast majority have never used it at all. Lowered vitality due to life in poverty and squalor ! This will not help the milk

infectionist. The matter of dosage of the infective agent must count for something, and the class of society using the largest quantity of milk should show the greatest amount of infection. And you who believe solely in the lowered vitality theory look about among your own patients and mark out the vast majority of your cases as strong, healthy persons prior to the onset of the disease. If we compare man to man, woman to woman, especially child to child, the poor will show stronger and more robust than the well-to-do. Surely tuberculosis is a filth disease. Plague, cholera, typhoid fever, smallpox, most any of the communicable diseases affect the poor more than the rich; but even so, it is plain that this is so not because they are poor and ill-nourished, as because they are filthy in their habits and live in the constant presence of the contagium, therefore receiving the infective material with regularity and in greater dosage. I am perfectly willing to step aside here and grant to the phthisio-sociologist that the infection will have a wider range because of this poverty; but again it must be plain that the social conditions serve the exact requirements for introducing the proper amount of the contagium into the bodies of these people who necessarily live day in and day out in such an environment.

Now there are many interesting phases in this spread of tuberculosis, none of which have received more attention than the question of milk infection. To bring the matter before medical men in the proper way I began a collection of data from all over the world, and by the kindness of officers of the State Department and other officers of the Government some valuable facts are presented which seem worthy of careful consideration. One of the most important items of information Salmon himself furnished me, and that was that the cattle of the isles of Jersey and Guernsey were free from tuberculosis, and were admitted into this country without the tuberculin test. Naturally the question presented itself, Are the natives of these islands also free from the disease?

Through the American Embassy at London some very interesting reports and personal letters were obtained confirming the reports that the cattle on the isles of Guernsey and Jersey do

not have tuberculosis. These letters and reports also show that the residents of these islands do have tuberculosis just about as much as we should expect to find elsewhere under similar environments. Dr. E. Stanley Hoare, the medical officer of Guernsey, had already taken notice of this phase of the subject, and he called attention to it in his report of May, 1902. In the Isle of Jersey the cattle are free from tuberculosis, and the people have it just about as they do on Guernsey. There seems to be a flaw in the milk theory here.

The statement has been made a number of times that the disease was unknown in Iceland up to a few years ago. Dr. Jonassen, the State physician, in a letter to his government, in reply to mine, states that the disease has existed in Iceland certainly from 1849, when a Danish physician, Schleisner, reported upon it, though there were but few cases found. The disease has increased since 1890, being influenced, he thinks, by the influenza epidemic. "In regard to cows' milk," he says, "it may be stated that it is one of the most important articles of food on every farm. This is the case now and always was the case, even at the time when tuberculosis was seldom found in Iceland."

I have been unable to ascertain if the cows of Iceland have tuberculosis, as there seems to be no inspection or examination. From another source I learn through Mr. J. Vidalin, of Reykjavik, Iceland, a prominent merchant there, that he had never heard of the cows being infected. The cattle are all native, and it would prove interesting if the Danish Government would send an expert to Iceland to test them out.

Lieutenant D. N. Jarvis, of the United States Revenue Cutter Service, has had an extensive experience with the Alaskan Indian, and he writes in answer to my queries:

"1. The Alaskan Indian, including the Esquimo and Alieut, apparently has consumption of the lungs to a great and increasing extent. This holds true in all parts of the country.

"2. He does not use milk of any kind as an article of diet to any extent, and cows' milk not at all. In some parts of the country, particularly Southeastern Alaska and in the neighborhood of large mining camps, condensed milk is used by the

Indians when it is possible for them to buy it, but I should say that even this cuts no appreciable figure in his diet."

Dr. S. J. Call, also of the Revenue Cutter Service, in answer to my queries, writes that,

"1. Alaskan Indians have consumption of the lungs, and this disease is one of the most prevalent found among them, particularly those of the Aleutian, Pribiloff, and Shumagin Islands, and the inhabitants of the coast.

"2. The great majority use very little cows' milk or canned milk. In fact, some of them have never seen a cow. In some localities they prefer the condensed article to any other kind. Not so much for food as they do for the manufacture of their beer or kwass. This is because it contains more sugar than other varieties."

Now, gentlemen, you who are interested in the vastness of things turn to the population tables and see there that the majority of the people of the world do not use milk as an article of diet. Turn to China, with its immense population, to Japan, the Hindu and most of the Oriental races. In Hindustan the clansman who does not drink milk or eat meat dies with equal constancy alongside of the Mohammedan Hindu, who does eat meat and drink milk. Surely there is something else at work in the spread of the disease among these people.

The data concerning Japan and China have been previously published, but they are again brought to the notice of the thoughtful reader.

"The prevailing impression that China is overcrowded is incorrect. It is true only in certain regions near the seacoast, such as Canton and Shanghai. The population of the whole empire of China proper (which excludes the sparsely settled regions of Manchuria, Mongolia, and Thibet) averages considerably under 300 to the square mile, even accepting the best estimate made of the total population, 380,000,000, furnished by the Imperial Maritime Customs reports. The most densely peopled province is Kiangsu, in which Shanghai is situated, which contains about 850 to the square mile. But this is a most fertile plain, penetrated in all directions by navigable waterways. The province

in which Canton is situated averages about 241 to the square mile, as against Java's 554 or Belgium's 579. There is overcrowding, of course, but it is a feature of certain parts, just as it is at home. Now as to your queries: (1) For reasons above given, it is impossible to secure any statistics that will show the relative death rate of tuberculosis as compared with other diseases. (2) My own impression is that the disease is quite common, not only in crowded districts, but elsewhere. This impression is borne out by the testimony of medical missionaries and others. Dr. S. Wells Williams, in his *Middle Kingdom*, vol. ii. p. 130, says that consumption is common at Canton and Chusan. The latter place is an island off the coast near Ningpo, where formerly the British made a settlement, afterward abandoned. Last autumn I was requested by Mr. Conger to make some inquiries into the prevalence of certain diseases, among them tuberculosis was mentioned. I wrote to medical missionaries in various parts of China, and from their reports I gather the following: Dr. Peck, of Pao-ting Fu (85 miles southwest of Pekin), says: 'Tuberculosis in all its forms is the great scourge of North China. The bacillus produces its characteristic ravages not only in the lung tissue, but in the bones, the skin, and bowels. The habits of life among the people make every house a culture bed for all sorts of bacteria and bacilli.' Dr. Peck has had twenty-two years' practice in this region. Dr. Gaterell, of Pekin, wrote: 'With regard to syphilis and consumption I would say that both these diseases run riot in this part of China.' Dr. W. H. Boone, of Shanghai, one of the oldest American physicians in China, says: 'Consumption and cancer are common in this part of China.' Dr. Macklin, who has had seventeen years' practice in Nankin, says: 'Syphilis and tuberculosis are exceedingly common.' (3) The use of milk as food by the Chinese is so rare that one may say practically that they do not use it. I have never known a Chinese to use it except where he had acquired a taste for it by living with Europeans; but the Manchus and Mongols use it in large quantities. I have not been able to learn as yet whether or not they suffer more than the Chinese from tuberculosis. I have known human milk to be prescribed by

Chinese physicians for aged people, but not cows' milk. One reason may be that very few cattle are reared by the Chinese, and those few are kept for ploughing, not for food. An exception may be noted in the case of Mohammedan Chinese who do eat beef, but even they do not, so far as I have observed, use the milk. Ordinary Chinese are averse to eating beef, from religious scruples. (4) I do not know whether the cattle in China are much infected or not; shall make inquiries upon this point and write you again." (Rev. E. T. Williams, Secretary American Legation, Pekin.)

"First, it may be stated positively that cows' milk is a factor of no account in the etiology of tuberculosis in Japan, for the reason that, speaking generally, it is an uncommon article of food among the Japanese. This is a fact so familiar to every observant traveller in Japan that it requires no further comment. According to the census of 1899, there were in Japan 769,163 cows and 483,702 bulls, and in the same year 208,877 cattle were killed for food. The population was 44,260,642. The cattle are unevenly distributed, but in one large district averaged only about 9 per 1000 of population. At a true Japanese hotel I have never seen milk or any article of food containing milk, unless specially ordered, and in the country and smaller towns it is usually not to be had. Of course, it is used in the large cities where the foreigners dwell. Butter and cheese are largely imported from Europe, but, generally speaking, are not used by Japanese. Ice cream I may mention is attaining some popularity with the city people. It seems probable that the causes of tuberculosis do not differ essentially in Japan and America, unless an insufficient dietary and comparatively temperate habits as regards the use of alcoholic liquors may influence the mortality in the former country. Total number of cows for milking purposes in Japan 25,534 (1901). They are very unequally distributed, thus: Tottori Ken, population 412,000, contained in 1901 only 56 cows for milking purposes. Tokyo, population 1,907,000 (not including about one-quarter million non-resident soldiers and students), contained 3400 cows for milking purposes. The chief use of cows' milk among the Japanese is

medicinal, it being prescribed by physicians in certain cases of illness.

Year.	Population of the Japanese Empire.	Died from consumption.
1897	43,288,863	65,597
1898	43,714,142	72,708
1899	44,205,873	75,796
1900	44,710,073	78,972
1901	45,227,464	81,669

"Among those who died from consumption during the year 1901 there were 42,259 males and 39,410 females, total, 81,669." (Assistant Surgeon Dunlop Moore, United States Public Health and Marine Hospital Service, Yokohama, Japan.)

In the Philippines milk is seldom used, and in Cuba and all of the Spanish-American countries milk is invariably boiled before using, and yet we know they have tuberculosis. These are facts that cannot be ignored and lightly set aside. To reach a correct understanding of the causes of the spread of the grim monster we must lay aside sentiment and come face to face with the truth, and at the bovine infectionist all the above facts are shaken as the red rag of challenge.

DISCUSSION.

Dr. A. Jacobi: We have been told that cases of tuberculosis are very numerous and very fatal in countries where no milk is being used. Nobody doubts that. We also know and always have known that the principal mortality in our own country where much milk is used is not attributed to the use of milk at all, but to other causes. The question is simply whether tuberculosis can be the result of improper milk—that is, milk that contains tubercle bacilli; whether there are cases which, in all probability or with certainty, are attributable to the use of raw milk. That is the question—not that millions die of tuberculosis who have never used milk. What we have to do is —if we can—to answer the question as to whether milk is a possible or probable factor in the spread of tuberculosis. One hundred negative cases or assertions do not prove anything against a single positive one, and there are such positive ones. The literature is too rich to be overlooked, and I would simply refer to that. There are, though there be ever so many off-hand denials of the fact, authenticated cases of general tuberculosis attributable to milk,

or where tubercle bacilli have been found in the milk and were undoubtedly, particularly children, affected by it. In adults we seldom have an opportunity to attribute tuberculosis to milk. They eat a great many other things. Infants or children are more or less restricted to milk, and among these are the cases. If, for instance, we have a case such as that of Ollivier's, where in a boarding school a number of girls were fed on milk that was found to be tubercular, and a large number of these girls died in consequence; when you have other cases in which a single cow was singled out for the special purpose of feeding the farmer's baby, and where that child was the only one that died of tuberculosis, and the cow died after the child, of tuberculosis, such cases, by no means exceptional, although they are only isolated cases, prove more for the possibility of tuberculosis being spread by tubercular milk than any number of negative cases. I do not say that cases are very numerous, but they are numerous enough to induce us not to let up on watching milk for the presence or absence of tubercle bacilli, and, *in case of doubt, boiling or sterilizing.* That is a reason, also, why for a long time we have come to the practice of rather mixing the milk that comes from a farm, as I suggested forty years ago, mixing the milk of a herd of thirty or forty, because it has been found that when the milk of one tubercular cow was mixed with the milk of so many cows not tubercular the milk was so diluted, as far as the percentage of bacilli was concerned, that practically it proved uninjurious.

All these are facts that should not be lost sight of. It is quite true that there are a thousand more cases of tuberculosis that have nothing to do with milk, but there are quite a number of them that have.

Dr. Delancey Rochester: It seems to me that in Dr. Cobb's paper there is one thing of value, and that is his statement in regard to the swine being infected from cows' milk. The swine is very closely related physiologically to the human being, and the fact that the swine can be infected from cows' milk goes to prove absolutely that other animals, such as man, can also be infected from cows' milk. With Dr. Jacobi I agree most thoroughly that a great number of negative cases proves nothing, and we have distinct positive evidence that milk can be a factor in the transmission of tuberculosis. Dr. Cobb's question is, "Is milk a factor?" Nobody thinks that it is the great factor; but it is possible, I think, and proven beyond dispute, that it is a factor in the spread of tuberculosis.

Dr. Karl von Ruck: In regard to the intercommunicability of human and bovine tuberculoses the experimental work of the German Imperial Health Bureau, recently reported by Kossel, Weber and Heuss, gives additional evidence.

Out of forty-one cultures of tubercle bacilli obtained from forty different cadavers four of them showed the characteristics of bovine tuberculosis. The

remaining cultures caused only local effect at the point of infection, extending to the neighboring gland and then healed.

These four cultures came from four children under six years of age, three from the mesenteric glands, and one from the lungs, the seat of miliary tuberculosis.

While these results leave apparently no doubt that the tubercle bacilli from these four children had a bovine origin, it is not unconditionally shown that the tuberculosis which proved fatal in these children was due to bovine tubercle bacilli, for it is possible that, although suffering from a human infection, the bovine tubercle bacilli could have entered through the intestine with or without local multiplication, becoming deposited in the mesenteric glands, or that in the other case they were inhaled and remained localized in the lung. When material containing them was used for infection of guinea-pigs and rabbits, these animals being more susceptible to bovine infection, the latter could have controlled the course of the disease of the experiment animals, and when pure cultures were obtained from them they naturally were of the bovine variety. I mention this possibility in the light of the fact that all other thirty-seven cultures, some of them also from primary intestinal cases, failed absolutely in the experiments with cattle, and also because of the analogy in the study of avian tuberculosis, where Kruse isolated an avian culture from a guinea-pig that proved virulent to fowls, but failed to show virulence when used for infection of other guinea-pigs. We know now beyond a doubt that fowl tubercle bacilli are not virulent to guinea-pigs, and yet the cultures spoken of came from a tuberculous lesion of a guinea-pig. The possibility of the particular guinea-pigs and the rabbit used for isolating the cultures having had a recent accidental bovine infection is also to be thought of.

The supposed infection of thirteen girls in a boarding school, of whom six died, reported by Ollivier, and which Dr. Jacobi mentions in support of milk infection, has been frequently quoted in literature by others; but Ollivier was obliged to subsequently correct his report on its being shown that the milk from the tuberculous cow, supposed to have been drunk by the pupils, was, in fact, consumed by the teachers of the school, upon whom it had no ill effect whatever. The girls did not get any milk to drink at all. Ollivier's correction of his first claims seems to have escaped the notice of many of Professor Koch's opponents.

The danger of infection of nurslings by the use of milk from tuberculous cows, and the importance which von Behring attaches to this mode of infection, appears an exaggerated one, at least from the clinician's standpoint. I believe, however, that von Behring has by no means denied the possibility or even probability that such infants are not also liable to infection from human sources. He holds that tuberculous infection occurs in an early period

of life, and, believing in the infectiousness of bovine tubercle bacilli for man, he sees in milk the chief medium of transmission.

In this connection it is well to remember that three of the cultures having bovine characteristics isolated by Kossel, Weber and Heuss came from the mesenteric glands of children between three and one-half and six years of age, and unless further investigations of the relation of bovine and human tuberculosis show evidence to the contrary, we are constrained to accept a bovine origin of the infections in these cases.

Dr. Robert H. Babcock: I understand the essayist to claim that the transmission of bovine tuberculosis in the herd was from the feed-box. That, undoubtedly, is so in perhaps a large percentage of cases; but that the transmission in a herd is through the milk is also well established. There is a well-known herd near Chicago kept by a man named Gerler who supplies milk to the city; his herd is tested for tuberculosis every year, and in one year the herd of one hundred and fifteen cows was tested with tuberculin and found absolutely free—not a single creature reacted. The next year a number of young cattle which had been calves the year before—raised right on his own farm—were tested with tuberculin, and a number of them reacted. Unable to explain this fact, Mr. Gerler made inquiries, and found that those particular calves had been fed with milk obtained from a neighboring dairy; that the milk supplied by his own cows was not sufficient for his calves, and that the head herdsman had obtained milk from a neighboring dairy and fed it to those particular calves, and it was those particular calves that reacted next year to tuberculin.

Dr. Edward R. Baldwin: Several points have been mentioned already in this discussion, but I do not think the question, which is so very much discussed in Europe at present, as to the relative importance of bovine infection, which discussion has thoroughly brought out the position of the various men, has fully presented their views. Prof. Behring, for example, does not hold without qualification that all human infection comes from the bovine source; but he does think that the bovine is a very prominent and very frequent source of human infection; but he also admits, and he thinks it very probable, that the bovine milk becomes contaminated from *human* sources while the infant is being fed during the first weeks of life. This point has not been sufficiently brought out, and while Prof. Behring has himself a great many opponents, I think it is only fair that we should fully understand his position, because a very few years possibly may change our ideas fundamentally as to the time of infection from tuberculosis. Whether we change our ideas as to the origin of the infection or not remains less of a question in my mind. It does seem that it is proven beyond peradventure that bovine tuberculosis may be transferred to the human. We do not need to go outside of our own

country to have had proof of that before the German Commission undertook their work. Prof. Theobald Smith has had several cultures which were obtained from different children, and one out of three of these cultures (obtained from the mesenteric glands) proved to be highly virulent for all members of the bovine species, as I have personal reason to know. It produces typical bovine tuberculosis in the most virulent form. This culture was obtained from a child. No proof is more direct, because in the majority of cases, as we know, human bacilli are unable to affect cattle. This particular culture infects cattle without any difficulty whatsoever. Prof. Smith has no doubt in his own mind from this peculiarity of the culture and from the bacteriological point of view that it was originally a bovine bacillus which was implanted in this child. There are other proofs which Dr. von Ruck has already mentioned in the report of the Berlin Commission. The recent report of the English Commission which has been investigating the subject, and which Dr. Cobb referred to, gives the unqualified statement that they think that bovine tuberculosis is transmissible to human beings; so that Prof. Koch, whose statement at one time was somewhat unguarded, seems disproven. It was not held by him that it was absolutely *impossible* to infect the human being from the cow, yet his position has been to defend that view. On the other hand, Prof. Koch has been proven wrong by his later investigations; so that the position to-day is one rather not as to where the infection of human tuberculosis originates, but as to the time of its infection—the time when the bacillus is implanted; and the most important thing, it seems to me, this Association ought to have in mind is to adjust our ideas to the possibility of a very early infantile infection, as Prof. Behring holds. I do not say that the evidence is unquestionable. Prof. Behring himself has the opposition of almost all the pediatrists; he has the opposition of almost all the prominent men who have given very much study to this question. On the other hand, his experimental work is worthy of every investigation; his authority in other things is unquestioned, and Prof. Behring's present position requires the careful investigation of every member of this Association.

Dr. J. O. Cobb: For a long time I held to milk infection as being the only way in which tuberculosis was transmitted. After thinking it over carefully I discovered that my holding to that theory was a matter of sentiment. To-day in America, and especially in Germany and France, the best pathological work is being done by the veterinarians. The great veterinarians—the majority of them—cling tenaciously to milk infection, and I think the reason for this is because they cannot accept and cannot believe that the disease is by inhalation. The majority of people do not believe that ordinarily tuberculosis is by inhalation; they believe that it is an ingestive disease, and I think that Aufrecht undoubtedly has given us the correct histopathology.

If he is correct, then the bacillus first gains the circulation and is later screened out in the lungs. I believe he is right.

You are all familiar with the work of two French experimenters in which they fed to fasting dogs large dosages of infected bouillon cultures, and after a certain time—I think as early as two or three hours after the ingestion—the dogs showed bacilli in smear preparations from the thoracic duct, showing that bacilli were taken up from the intestinal tract—taken into the thoracic duct without lesion in the abdominal cavity. Now, that threw everybody off the track, and one and all were ready to fly back again to milk as the medium of infection. Surely tuberculosis is an ingestion disease, and one naturally asks, Whence comes the infection, and what is the medium of infection? Milk? They say milk, and so I myself thought for a while. It may be milk for the American and the European, but of one thing we can make positive assertion, and that is, that milk is not a factor with the Oriental races. In talking to a hard-headed old Chinaman one day, I said, "John, how do your people get tuberculosis over there?" He said, "I do not know; I hear you doctors over here talking about people drinking milk; the Chinamen do not drink milk." This was over ten years ago. I knew a very intelligent Japanese, and I asked him about the Japanese drinking milk. "No," he said; "no, they do not. I was raised in town; I seldom saw a cow. When I went out into the country occasionally I did see cows."

My object has been to clear up the obscurities concerning the method of spreading and the medium of infection, and I have been compelled to throw away my regard for the veterinary side of it. The veterinarians have done grand work, and I would do nothing to throw an obstacle in their way, but we have too many scattered ideas on tuberculosis; we must come to a concrete conception of the disease. Let us get down to this simplest every-day problem, and find out how average cases, the common cases, receive their infection. I have thrown away all sentimental regard for the veterinarian and the work that he has done, and I would contend, if it is milk, let him prove it; and he cannot prove that, commonly speaking, tuberculosis is transmitted by milk. I am talking about "commonly." You all know that Nocard diverted bovine bacilli to avian, and I have no doubt that bovine bacilli can be diverted to the human species. In like manner, I would not be surprised that the lepra bacillus could be diverted to the tubercle bacillus by the same technique. Dr. Leonard and I are doing some experimental work on the butter bacillus, in which we are planting this harmless bacterium in the abdominal cavity of animals and keeping it there a long time and producing lesions that one macroscopically could not tell from genuine tuberculosis, though the true tubercle is absent under the microscope.

I hoped to have the honor of jumping on Dr. Jacobi about those school-

girls, but Dr. von Ruck called attention to that error. That is an old error that has been denied years and years ago. Those girls did not drink the milk of that cow at all—the classical case that has been described so often and been denied a number of times. Dr. Babcock's account of the milk infection to calves is hardly to the point, for I previously said that the infection was from one animal to another animal in that class of susceptibility. Of course, I thought it would be naturally understood that, if one cow were fed on milk of another cow which had the disease, that the cow would develop the disease; but, commonly speaking, cattle develop the disease one from another in their immediate environment.

Dr. Cobb called attention to a newspaper report of even date briefly summarizing the British Commission's final conclusions that bovine and human tuberculosis are practically the same.

CASES OF PUS INFECTION SIMULATING PULMONARY TUBERCULOSIS.

By ROBERT H. BABCOCK, A.M., M.D.,
CHICAGO.

The first case which opened my eyes to the possibility of a person ill with septicæmia being thought to have tuberculosis was in a young married woman whom I saw in consultation in 1897. Two physicians of great experience and wide reputation had seen her and pronounced the disease tuberculous. The information at first conveyed to me by the attending doctor was in effect that the patient had a cough with high fever and emaciation, and had been ill for nearly two months.

After noting the hot, dry skin, marked loss of flesh, and rapid, feeble pulse, I proceeded to examination of the chest. Nowhere was there pronounced dulness, yet both lungs were defective in resonance, the left slightly more than the right. The breath sounds were harsh and of diminished intensity, but without rales. Nevertheless, here and there was what I should call a suggestion of moistness. The voice was too weak to produce distinct vocal fremitus. In short, the lungs were not normal, and yet did not furnish definite signs of disease.

I then turned to the abdomen and discovered that, instead of being thin and sunken, it was distended and appreciably resisting. Neither spleen nor liver could be palpated, and, instead of hyperresonance, percussion yielded dulness of an irregular outline over the lower half, in the hypogastrium as well as in the iliac fossa. This state of things was readily shown not to be due to free fluid in the peritoneal cavity. Here, then, was a condition that did not fit in with what one would expect in a person having pul-

monary tuberculosis. The clinical picture, as shown by the height of the temperature, was not that of incipient tuberculosis, nor was it a more advanced stage of tuberculous disease, since, although the fever was severe and wasting, there were no marked evidences of breaking down of pulmonary tissue.

I considered the possibility of acute miliary tuberculosis, but reflected that in such a case there ought to be more definite pulmonary symptoms, as dyspnœa and perchance an occasional rale or some area, however small, of distinct dulness, with bronchial breathing. Moreover there was no perceptible splenic tumor and no appreciable involvement of bronchial or other lymph glands. On the whole, therefore, I decided before committing myself to a diagnosis to enter more minutely into the history than I had yet done. In particular I felt I must get at the condition responsible for the abdominal findings, and which, as I suspected, might be responsible for the whole thing.

The attending physician did not have a very clear knowledge of the woman's previous health, being evidently dominated by the notion of it being a case of tuberculous disease. To make a long story short, it was ascertained that some eight or ten weeks earlier she had had an abortion which had been followed by a foul vaginal discharge. Two or three weeks thereafter she had been taken suddenly ill with pelvic pain and fever. Although there had been an insignificant cough previously, still her real illness dated back to the abortion.

In brief, I gave it as my opinion that there was no tuberculosis about the case, but that it was one of septicæmia originating in a pelvic peritonitis, with purulent and circumscribed exudate, and that the indefinite lung findings were due to some pulmonary change resulting from her infection and feeble cardiac action. I urged the immediate services of a surgeon who should operate if he thought best. My advice was acted upon, and the operative interference, although too late to save life, fully confirmed the correctness of my diagnosis.

At a later period I was called to examine the lungs of another patient, a man who in sliding down from a stack of hay had struck on a pitchfork, the handle of which had penetrated the anus and

caused severe injury. The trauma had been neglected or improperly treated, and a suppurative peritonitis had eventuated. In this case the lung findings were very similar to those described, general loss of resonance with feeble, rather harsh breath sounds, but no rales.

For a considerable time I was at a loss to explain the pulmonary findings in these two cases, but I now believe they were the result of pulmonary anæmia. Such an explanation seems to me in accord with the experiments of Grossmann and Basch. These experimenters found that anæmia of the lungs leads to diminution and relaxation of these organs, with passive decrease of the capacity of the thorax and potential increase in the excursion movements of the lungs. In a state of profound prostration, together with enfeebled circulation, as is the case in severe and prolonged blood poisoning, the resulting pulmonary anæmia would show itself by relaxation of the lungs and diminution of their volume. The prolonged repose in the dorsal decubitus would produce feebleness of respiratory movements, notwithstanding the fact that potentially these are increased. Consequently these factors would lead to impairment of resonance and an alteration in the quality of the breath sounds. It might well be, therefore, that, misled by a faulty or incomplete anamnesis, the examining physician might at first be puzzled to account for the pulmonary findings, and might regard them as suspicious, to say the least, of tuberculosis.

The remaining three cases, to be briefly narrated, were ambulatory, and consulted me because of symptoms, slight cough, a low grade of fever, and loss of strength, which were feared due to incipient pulmonary tuberculosis.

The first case of this series was that of a senior medical student who was sent to me by one of my colleagues in the fall of 1902, with the request that I look over his lungs. The meagre history elicited was of progressive loss of weight and strength, with a slight febrile temperature ranging from 99.5° to about 100.5°, and of a dry, hacking cough which, although insignificant in intensity, was yet thought suspicious when considered in connection with his other symptoms.

The young man was tall and slender, being decidedly below proper weight, his chest being flat and narrow. Inspection and palpation were negative, but percussion showed rather defective resonance over both apices, especially the right. On auscultation the breath sounds were bronchovesicular without rales. The temperature was about 100°, and the pulse was about 90, of low tension. There was nothing definitely indicative of pulmonary involvement, and yet, taken in connection with the general symptoms, the findings rendered me very suspicious of incipient tuberculosis.

He was advised to record his temperature carefully for a week, have examined any sputum there might be, spend as much time as possible out-of-doors at rest, and take an abundance of milk and raw eggs. I did not see him again for three weeks, when he reported his temperature as having ran about as before, his sputum negative, but because of the raw eggs, as he thought, an obstinate diarrhœa had developed. My second examination of the chest simply confirmed the original findings, while examination of the abdomen detected merely a scaphoid belly with some gurgling in the colon, but no tenderness.

He was then advised to go into a hospital, where his friend, Dr. Bayard Holmes, might have him under observation. The advice was followed, and as a result the diarrhœa ceased, but the temperature record was found so erratic that it led to a more thorough investigation of his case. As a consequence, it was ascertained that during the month of June previous he had been ill with symptoms that indicated appendicitis. It was also discovered that he had a pronounced leukocytosis which, together with the character of the temperature, pointed plainly to some other than a tuberculous infection. The location of tenderness and pain seemed to indicate gall-bladder disease, but at the operation it was found that the appendix was situated behind the lower border of the liver and was adherent to the surrounding parts and filled with pus. The patient not only made a complete recovery, but is now engaged in active practice of his profession, and is in robust health, having gained twenty-five pounds or more in weight. There can now be no thought of tuberculosis.

The next case had to do with a tall, thin, narrow-chested bookkeeper, who came to me because of stomach trouble, increasing loss of weight and strength, and a dry, hacking cough that made him and his friends uneasy. Aside from the facts just stated, he gave a history of an illness nearly three years before, which he called rheumatism. Examination of the chest disclosed impaired resonance behind the right, chiefly in the scapular and intrascapular regions, with bronchovesicular breath sounds, but no rales. He had a slight elevation of temperature and looked poorly nourished.

In spite of these facts I could not convince myself that the lung findings were responsible for his general symptoms, and therefore inquired minutely into the so-called attack of rheumatism. This elicited certain facts that satisfied me of the rheumatism having really been a biliary colic which was repeated several times during a period of weeks. I therefore made a careful examination of the abdomen and had no difficulty in detecting a tumor of the gall-bladder. Believing this was an empyema of this viscus, and finding the man had a pronounced leukocytosis, I referred him to a surgeon. An operation was performed soon thereafter, which not only confirmed my diagnosis but completely cured the patient.

He was recently re-examined by me, and found to have gained nearly thirty pounds and to have entirely lost the slight dulness previously detected in the right lung. This convinces me that the impairment of resonance formerly noted depended upon the gall-bladder disease. It may have been the direct result of mechanical pressure from the tumor, but was, I think, a manifestation either of pulmonary hyperæmia resulting from vagus irritation, or more likely of the so-called lung reflex which Abrams has shown may result from sensory irritation, as of the abdominal wall. Irritation of the skin of the anterior surface of the belly causes a demonstrable but transient elevation of the lower posterior border of the lung on the corresponding side, and since in this case dulness existed only behind, it may be, perhaps, that the presence of the distended gall-bladder occasioned a persistent lung retraction, with corresponding impairment of resonance.

The third case was that of a woman, aged thirty-three years, who was referred to me in January, 1904, because of symptoms thought, perhaps, to be due to some pulmonary involvement, possibly tuberculosis.

Cough was trifling and, as well as all else, was ignored in the presence of attacks or rather exacerbations of pain, referred to the lower thoracic and upper abdominal zones, chiefly on the right side. Her description of her suffering made me at first very suspicious of gall-bladder disease. A clear anamnesis was most difficult to obtain, but at length I learned that some eight or nine years before and soon after her marriage she had had inflammation of the ovaries, as she said, which symptom-complex had been repeated two years ago, and had necessitated local treatment.

My examination disclosed a temperature of 100.4°, slight dulness, with bronchovesicular breathing in the left upper lobe, both in front and behind, and tender, slightly enlarged Fallopian tubes.

Being doubtful of the precise nature of this case, but suspecting pus tubes in addition, possibly, to incipient pulmonary tuberculosis, I instructed her to send some secretions from the vagina for examination and to keep her temperature chart for a week. The vaginal secretions did not show gonococci, but her temperature record was entirely too erratic and high to correspond to the changes in the lungs. Her leukocyte count, moreover, was 12,000. I consequently referred her back to her physician for further examination and possible operation on the uterine adnexa. I have since learned that a surgeon removed both tubes and ovaries, as the pyosalpinx had involved the ovaries. The patient made a good recovery, has lost her cough, and enjoys good health, with the exception of shifting pains in the shoulders, which her physician regards as rheumatic.

With the foregoing cases in mind I can recall three others which at the time were regarded as tuberculous and were sent to Colorado, but which I now suspect were not tuberculous. One of them, a lad of about fifteen years, subsequently died in the care of Dr. C. F. Gardiner, of Colorado Springs, without definite

lung changes ever having been detected, and the other two were unmarried women in the care of Dr. S. G. Bonney. In none of them, if I rightly recollect, were positive signs of pulmonary disease discovered, although their temperature and other constitutional symptoms were highly suggestive. Their subsequent history is not known to me.

In conclusion, I should like to dwell on the importance and value of a leukocyte count in cases with symptoms suggestive of incipient pulmonary tuberculosis, yet without distinctive physical signs. In early tuberculosis the leukocytes are likely to be either not increased or actually diminished, whereas in cases of pus infection there is leukocytosis, although this may be slight. In mixed infection, of course, there may be an increase in the polymorphonuclear cells, but in such cases physical evidence of pulmonary disease is such as to leave no doubt of its nature.

It is unnecessary to state the value and, as a rule, the safety of the tuberculin test in doubtful cases of the kind here narrated. It would have been resorted to had the diagnosis not been established by other means.

The cases that furnish the text for this paper are reported not because unique, but because, on the contrary, they are believed to represent a rather frequent class of cases, and it is hoped their recital may aid others in avoiding some of the pitfalls that beset the differential diagnosis of incipient tuberculosis. We all recognize the close relationship existing between diseases of the lungs and derangements of circulation within the abdominal cavity. These cases also teach how great may be the interdependence existing between disturbances within the abdomen and the state of the lungs apart from obvious mechanical pressure. In other words, healthy lungs and normal lung findings can only be expected in healthy bodies. If, in endeavoring to pass judgment on an individual's lungs, the physician confines his attention to these organs he will find his field of view too limited to permit of a really intelligent opinion.

DISCUSSION.

Dr. S. E. Solly: I do not remember such a case in my practice as is described by Dr. Babcock; but I can well believe his diagnosis is correct, because one not infrequently hears sounds in the chest which prove to be transitory or apparently reflex.

It is not uncommon for a physician to be very much alarmed at such symptoms, and thinks there exists a rapidly advancing tuberculosis, when really the condition is reflected from some other organ, or from some disturbance outside the chest; therefore, Dr. Babcock, in calling our attention to these particular points, is doing us a great service.

All this goes to show that a man who practises as a specialist ought first to have been a general practitioner, so that he is able to explore beyond his own narrow field, and correctly interpret such phenomena.

Dr. J. O. Cobb: I think that Dr. Babcock's cases are really infected pneumonias, because we all know that the pulmonary tissue acts as a screen and sieve to take out of the circulation any infective material in it. We are all aware that interference with a gluteal or rectal abscess of tubercular origin often sets up a very rapid infection of the lungs. The lungs and liver are essentially the sieves for the circulation, and I think that is the explanation of Dr. Babcock's cases of lung consolidation in the case of an ordinary pus infection elsewhere. Now, if that pus infection elsewhere were due to streptococci and they got into the circulation and were screened out in the lungs, then we would have a pyæmia—a very rapid pyæmia which would destroy the patient. But it has been brought forward that even gonococci will be washed out in the lungs and produce a consolidation and still not break down; but streptococci will invariably break down, but not always diplococcus infection. We have that illustrated from mastoid infection where it is not due to the streptococcus, for often you will have an infective pneumonia, and I think that is the explanation of Dr. Babcock's cases.

Dr. Babcock: I really cannot add anything to what I have already said. I think it well to emphasize this point: that inasmuch as circulatory derangements within the abdomen may be secondary to pulmonary disease, may it not be that circulatory derangements within the lungs may be secondary to abdominal disease? I am interested in Dr. Cobb's suggestion, that the abnormal pulmonary findings were due to infection. So it is; but it did not seem to me that in any one of my cases there was actual lung consolidation. The dulness was not intense enough, nor were the breath sounds distinctly bronchial. It impressed me much more that there was simply some circulatory disturbance in the two first cases; that is, those in which there was pus infec-

tion from suppurative peritonitis. Therefore, I was inclined to attribute the changes, as I said yesterday, to pulmonary anæmia, for if pulmonary anæmia does produce relaxation and diminution in the volume of the lungs with passive decrease in the capacity of the thorax, it seems to me that such a condition could be responsible for the slight impairment of resonance and the change of respiratory murmur noted, and which was so slight as to be scarcely definable. Also, I believe, the general condition is favorable for the production of pulmonary anæmia in such cases.

In the case of gall-bladder empyema there was unmistakable dulness in the posterior aspect of the right lung. What that was due to I cannot say. I simply know it cleared up, and it is interesting to speculate whether it was due to mechanical pressure from a distended gall-bladder or was some circulatory derangement, as a pulmonary hyperæmia, depending upon the sensory irritation, or whether it was a manifestation of a lung reflex. Sticker narrates a very interesting case in which he saw a woman with very distressing and alarming symptoms of pulmonary hyperæmia and distention of the right heart secondary to a cholelithiasis. Relief from the pain of cholelithiasis brought with it the next morning a disappearance of the alarming symptoms. This suggested to me that perhaps in this case the pulmonary findings were really due to sensory irritation—ill-defined, to be sure, but sensory irritation nevertheless from the distended gall-bladder.

I would like for a moment to dwell also on the importance of a leukocyte count. This has become so common that we always think of it and resort to it, you know, in any case of suspected pus infection; but in these cases, which come to us sometimes with symptoms very suggestive of incipient tuberculosis, and in which the pulmonary findings are so vague that we are not quite satisfied whether pulmonary disease does exist or does not, I believe the leukocyte count is of value. Leukocytosis does not exist in pulmonary tuberculosis unless there be mixed infection, and when mixed infection takes place the pulmonary changes are so pronounced that anyone can discover them; whereas, in very early tuberculosis, those cases in which we desire for the good of the patient to discover the disease at a time when it may be amenable to treatment, the leukocytes are not increased, but are actually diminished.

REMARKS UPON THE GENERAL PRINCIPLES OF MANAGEMENT OF PULMONARY TUBERCULOSIS.

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Despite the vast interest attaching to the review of the tuberculosis problem, its present status must be regarded as somewhat unique in the diversity of opinion entertained by medical men concerning the rational management of the disease. This appears remarkable in view of the fact that the consensus of opinion among all qualified observers relates solely to the consideration of out-of-door life, rest, superalimentation, and a suitable *régime* as the all-important factors. It is difficult to understand how there can exist such widely differing interpretations of the application of these basic principles as to permit the resulting multiplicity of ideas and divergent methods of practice, where uniformity of thought and action reasonably might be anticipated. Yet there is being promulgated from numerous sources, bearing the stamp of authority and conveying perfect honesty of purpose, the indorsement of several distinctive methods of treatment which appear unalterably opposed to each other. These differences pertain to the various constructions placed upon the relative value of the above-mentioned essential principles. A more or less partisan appreciation of their comparative merits is developed by the immediate environment and special opportunities of the observers. Thus is to be explained the repudiation in some quarters of the advantages of climatic change for any case, and in others the advocacy of several totally differing localities for nearly all classes and conditions. In like manner

is noticed the strenuous insistence by some upon a rigid disciplinary *régime* within a closed sanatorium, as applicable to all cases of consumption regardless of many vitally important considerations, and at the same time an equally unyielding adherence by others to the alleged superiority of the conditions rendered possible at home. Unfortunately, the picture sometimes is painted in its most dismal colors by ardent opponents. The invalid in the mournful contemplation of banishment to a distant clime, incarceration within the walls of an institution for consumptives, or seclusion upon his back porch, and, perhaps, in an unsightly yard, often may wonder which fate can possess the least terror.

It does not necessarily follow that because one of these methods is rational in certain instances that the others are necessarily inapplicable for other cases. Manifestly each has much of merit, according to the individual conditions imposed, and through the exercise of an intelligent discrimination on the part of the medical adviser may be utilized for the material aid of an appropriate class.

Conceding that each case is a law unto itself and must be judged solely upon the intrinsic merits of its many component factors, is it not time that preconception of fixed ideas as to the management of consumption give way to a just recognition of the valid and established claims of several methods? The application of the various principles of treatment to an individual constitutes a responsible trust, the satisfactory fulfilment of which can be afforded only through a sufficient appreciation of its true character.

It is not the most complete interpretation of a single element, no matter how important, that is to accomplish the best results; neither is it the most radical conception of several thoroughly accepted principles, if at the obvious expense of remaining factors, perhaps not as well recognized, yet entirely pertinent to the invalid in question. The fullest measure of success in management is to be obtained only by the wisest possible grouping of all the favorable influences pertaining to the case itself. This imposes an obligation toward a painstaking regard for detail,

necessitating a vast amount of study as to the special needs and requirements in each instance. This personal effort directed to the critical analysis of all the phases of each case, historical, physical, temperamental, financial, domestic, social, recreative, industrial, etc., is absolutely essential in order to afford not only a wise preliminary guidance, but also to facilitate subsequently the continued adaptation of the consumptive to a proper environment. Thoughtful study and alert vigilance must be maintained throughout the entire period of observation, in order to provide such mode of life and surroundings as are especially appropriate to changing conditions, and in harmony with the varying needs of the patient.

This direct personal attention to detail constitutes the first cardinal feature in the management of pulmonary tuberculosis applicable alike to all climates and all methods.

The next consideration relates to the question of climatic change.

There should be no argument concerning the great value of such an influence in the treatment of consumption, provided there is instituted a proper selection of cases and a conjoined attention to mode of life. Desire to exploit the virtues of any particular climate herewith is disclaimed. Such practice as little becomes the medical residents of favorable localities as does the flaunting renunciation of climatic truths those who are pleased to indulge in such vagaries. May it not be asserted, however, that a consistent regard for the very principles upon which depend opposing claims necessarily carries with it an almost incontrovertible argument in favor of climatic change for a large number of cases. If out-of-door life constitutes a desirable feature of treatment at home, why is it not infinitely better when practised in such localities as permit its more complete fulfiiment? If fairly satisfactory results in early cases may be obtained by virtue of certain features of regimen without other beneficial influences, is it not reasonable to expect still better results and among a larger class of cases by means of the same watchful observation, with the added opportunities for out-door air, sunshine, warmth, and dryness, incident to favorable climates? It would appear

that only in such localities could the fullest conception of a proper method of living satisfactorily be conducted.

It must be insisted, however, that there is something in climate distinctly and entirely apart from these factors of sunshine and out-door air. Reference is made to the influence of altitude in wisely chosen cases as producing vesical dilatation, increase of hæmoglobin and red blood corpuscles, and improvement in the vigor of the circulation involving digestive and nutritional changes of vast import. Aside from such considerations as the foregoing, may be mentioned the value of the psychic element involved in all changes of residence. This can react for good or evil, according to the degree of intelligence and sagacity displayed by the medical attendant. Admitting a proper selection of cases and a sufficient personal interest and effort on the part of the adviser to provide suitable environment, there may develop factors of no little value in the novelty of new surroundings, change of food, scenery, custom, companionship, the relief from cares and responsibilities of home, and all the interest that attaches to a new country with its stir and energy. Can we afford, also, to entirely disregard the fact that certain climates exist where tuberculosis is very rarely indigenous, in spite of the existence of some factors that reasonably might have been expected to produce an increase of native cases? Are there not offered to imported cases better opportunities to gain in the midst of these influences which have prevented the development of the disease in others than when exposed to the same conditions that have been conducive to its origin and spread?

This course of remark is not presented as a plea for health resorts, but merely as an appeal for an impartial consideration of the subject in the interests of the invalid alone. The contention simply is made, that while many cases may be expected to do well under proper supervision, even if deprived of the advantages of climate, and that others, reference to which has been made in previous papers, are by no means appropriate for climatic change, yet there does remain another class entitled to receive it by virtue of every consideration, including the results of scientific research, of clinical observation, and the instincts of humanity.

It is hardly necessary at this time to define in detail the character of cases embraced in this class. A somewhat broad and comprehensive grouping of those for whom some climatic change is justly indicated includes:

First. All those with moderate infection who are not prevented from leaving home by financial embarrassment or other equally cogent reasons.

Second. Those in a similar physical condition, though with but a meagre monthly allowance, provided sufficient accurate information is obtained in advance concerning suitable accommodations at an expense within their limits.

Third. Those admittedly dependent upon their own efforts for support, but, nevertheless, with such slight pulmonary involvement as to permit the performance of out-of-door work in some favorable region where employment may be assured.

Fourth. Those with considerably more advanced trouble, but favored by a cheerful, sensible temperament, affluence, determination to succeed, an abiding hope with desire for climatic change, a ready compliance with instructions, and an apparent easy adaptation to new surroundings.

That this grouping of cases, subject only to qualification according to modifying individual factors, is reasonably correct is shown by the substantial facts of experience in favorable localities, where exceedingly remarkable results frequently are obtained in even very advanced cases and among those with most limited resources.

It thus follows that upon the basis of actual results an assuring welcome may be extended to at least some of those no less worthy, if less fortunate, than their fellows in their equipment and opportunities. It must not be understood, however, that those hopelessly ill or utterly impoverished should be encouraged for a moment to seek climatic change. For these, State and municipal sanatoria provision, along lines elsewhere suggested, becomes not only obligatory from a moral sense, but, as well, practical and economical.

As regards the large class with moderate infection, who, though much handicapped by lack of means, yet not absolutely impecunious, and the associated group of those with very incipient trouble

but dependent upon themselves alone, the decision of climatic change is fraught with much responsibility. The question must be reviewed plainly with the patient and family in all its phases according to the individual conditions in force, and is hardly subject to generalization. The real solution of the problem for these people consists in the opportunities at their disposal in favorable regions.

The consumptive poor, while equally entitled with those more favored financially to every aid that consistently can be offered, are at the same time necessarily subject to entirely different processes of thought. The interests of such a class are in nowise subserved by sending to a far country to battle against great odds among strangers, and amidst, perhaps, grossly unfavorable surroundings. A recognition of their inherent claims for assistance by virtue of promptings of human interest and a justification for advising a journey to a distant clime is found only by the definite knowledge of the ready facilities for their proper reception within the bounds of their limited resources. Admitting such provision, there would be no greater obligation upon society and the profession than to offer reasonable opportunities for such a class to secure a restoration of health and a resumption of earning power.

As regards the cases embraced under the first division, the somewhat sweeping assertion that all those with moderate infection in the absence of financial or other important reasons should be permitted to enjoy the benefits of climatic change, is based upon the fundamental principle, that such patients possess an inviolable right to receive that early unrestricted consideration and advice which an actual experience has demonstrated to be the safest and the most conservative.

An enormous class, who are intensely anxious to avail themselves of every rational opportunity to recover from their disease, appeal to their medical advisers for nothing less than that which offers the greatest and most reasonable assurance of ultimate arrest. Cases such as these willing to enter the lists engaged in the prolonged struggle, destined so frequently to be a trial to their patience and a test to their endurance, fortitude, and bank account, with their own existence and the happiness of near ones

as the issue, surely deserve such preparation and fortunate choice of battle-ground as will ensure the greatest probability of final success. The obligation of the physician is not fulfilled by advising merely what is admittedly good, but is satisfied only by urging what is actually the very best for the individual case. It is not a question of the advisability or even the probability of securing arrest at home, but whether such an environment of itself is the method most likely to accomplish this result.

Should not the physician, in assuming to direct the destinies of his well-to-do patients, make a practical application of the condition to himself, and advise in accordance with the course he would himself pursue under similar circumstances ?[1]

Another consideration pertaining to the management of consumption relates to the question of the closed sanatoria. Its great practical utility in certain carefully selected cases, and its non-adaptability to other equally defined groups, have been discussed at some length in a previous paper. For several distinct classes sanatorium management was described as actually being demanded. For others institutional treatment was thought to remain *sub judice*, and for still another division it appeared to be contraindicated.

Waiving at this time any consideration of its *rationale* and scope for the differing classes at home, its peculiar advantages and the great good it has accomplished, it is sufficient for present purposes to consider only its field of usefulness in favorable regions.

Paradoxical as it may appear, the proposition is advanced, based upon the results of a practical every-day experience, that residence within a closed sanatorium offers the best possible conditions to be offered in health resorts to a class of cases, and at the same time that a summary recourse to complete institutional *régime* distinctly is prejudicial to the best interests of others. These differences pertain to such determining individual factors as the financial status, temperamental peculiarities, and domestic conditions. Other considerations which justly may obtain are the possible accommodations other than institutional, and the character of the

[1] "The Sanatorium Treatment of Consumption," by the author.

medical counsel to be obtained either within or without the sanatorium. It may be asserted that the special advantages accruing from a properly conducted sanatorium are not altogether inherent to the institution itself. An ample porch accommodation with wise provision for private balconies and perfect heating and ventilation of rooms, all with sunny exposure and a generous tempting *cuisine*, of transcendent importance though they be, none the less are to be secured in many instances outside of closed sanatoria. Their attainment frequently is most difficult, and imposes a serious tax upon the time, energy, and perseverance of the medical attendant, yet in most communities the accomplishment of these latter conditions by no means is impossible through the interested personal attention of physicians who are willing to recognize their responsibilities with reference to such details.

There does remain, however, the problem as to the relative degree of success possible to be attained in the maintenance of a system of strict disciplinary *régime*. Upon this feature depends to a great extent the usefulness of closed sanatoria. Assuredly there is afforded opportunity for a more absolute and autocratic control than is permitted elsewhere. This continued vigilant supervision is sometimes necessary for the well-being of certain cases, while an equal amount of surveillance not only is quite unfortunate, but even detrimental, to the best interests of others. Furthermore, a perfectly successful supervisory direction depends, either within or without an institution, almost entirely upon the personal influence of the physician himself. As is stated in another paper, "It is almost purely a question of personal equation, and demands a certain aptitude for the peculiar requirements of the position and devotion to the work for its own sake, an interested and solicitous regard for the slightest welfare of the patient, a degree of sympathy, tact, and enthusiasm, which may almost be said to constitute a form of genius. This may be exercised without an institution as well as within, the sanatorium itself being, in most instances, a most beneficial accessory to this result rather than as a *sine qua non*. It is the man, not the institution, that determines the degree of co-operation and hearty good-fellowship between physician and *clientèle*, which alone ensures a proper

disciplinary *régime.*" By as much as it is not the sanatorium alone, but also the attending physician, that determines to a degree the influence for good, by the same token must it be remembered that it is not the disease to be solely considered, but the invalid himself.

This presupposes the consideration of other factors than its purely medical or sociological aspects. For the consumptive the question of success or failure depends frequently upon his ability to adapt himself to unusual conditions, and in this quality he is frequently found deficient. The wisdom of an intelligent modification or adjustment of the immediate environment to satisfy properly the demands of his peculiar requirements is readily apparent. It would seem that the patients for whom such institutions were most particularly appropriate, although by no means exclusively so, were those with such limited finances as to preclude the acquirement of satisfactory conditions without the benevolent aid of partially endowed sanatoria. Were it not for the truly philanthropic agency of such institutions in providing excellent accommodations at a minimum of expense, there could remain for those partaking of this benefit but slight justification for the original climatic change. As regards others, however, experience has taught that the medical adviser, if he so elects, may devote a sufficient supervisory attention to his patients outside an institution, and through the exercise of some painstaking effort may provide accommodations eminently suitable and adapted to their particular needs. There may be instituted proper methods of living in such abodes somewhat along the same lines as in well-regulated sanatoria. The same well-recognized principles may be enforced if they desire, upon a smaller scale and sometimes upon a less restricted basis, and frequently more to the actual advantage of the pulmonary invalid. All sanatoria either are or are not conducted solely for incipient cases. In the former case it is hard to see how the favored few with incipient infection and without complications actually can require upon their merits that degree of personal medical attention that necessitates living under the same roof. As regards those sanatoria receiving the average of consumptives as they come, requiring only, as a matter of fact, such cre-

dentials as the stipulated price of admission, it would appear that the social and physical conditions could scarcely be such as would best promote the happiness and contentment of the invalids. Aside from such considerations as these, which surely are more substantial than sentimental, may be mentioned the value of the psychic element to be observed from occasional judicious change of residence and immediate surroundings. This potent influence for good scarcely is obtainable to the same extent under the fullest interpretation of institutional *régime*.

Let it not be understood that there is implied the slightest reflection upon the very great utility of closed sanatoria, even in health resorts. The thought is presented merely in question of their invariable necessity of applicability for all cases.

The views herein expressed are based upon the results of somewhat extended opportunities for observation through the personal management of consumptives in a favorable climate. Fairly accurate records have been preserved in a series of over 1500 private cases that have come under my supervision. The clinical study involved in the effort to recognize essential facts, to analyze experience, summarize the various combinations presented, to apply established principles, and to effect a mutual interadaptation of individuals to special conditions has resulted, perhaps, in as close personal contact with consumptives and the varying confronting problems that inevitably result as could have obtained from the more or less routine observations with a corps of assistants in an institution. Those familiar with the nature of such work can readily appreciate the exacting character of the demands necessarily imposed. The conclusions that have gradually assumed shape in the absence of preconceived ideas have been subject only to the moulding influence of stubborn facts and a sternly real experience. Statistical deductions are avoided as unnecessary to this inquiry. Such have been included in several previous reports embodying results of clinical observation. As illustrative of methods employed and opportunities afforded, it is not inappropriate to allude in passing to the experience of a recent single year.

During 1902 there were under observation, of whom records

were kept, 302 cases; 138 of these had lapsed over from preceding years, yet more or less actively under treatment; 164 were new patients during the year. Of the total number, 167 were provided with accommodations to the best of my ability outside of any institution; 79 resided for varying periods at the Oakes Home for Consumptives without nursing and without hospital facilities other than relate to an excellent location, immaculate cleanliness, scrupulous disinfection of apartments and clothing, ample out-door facilities, excellent table, sunny rooms, well heated and ventilated. The institution is decidedly unique and without a parallel in its peculiar scope, is open to any practising physician, and, therefore, without any definite or fixed system of medical *régime*. There is permitted to any medical attendant, however, the exercise of such supervisory control for his own cases as he sees fit to institute or has the power to maintain; 39 additional were privileged to occupy rooms in the hospital addition, with special facilities to secure out-door air conjoined with rest by reason of private balconies, and also enjoy the benefits derived from constant skilled nursing. During the last four months of the year there was constructed, through the charity of Mr. Charles L. Adams, an annex to the institution, which provided for the most excellent accommodation of 40 people with limited means at a normal expense. During these four months 25 of my patients resided in this building, each enjoying the advantages of a large private porch opening from the bedroom. None of the above-mentioned patients could be said to be contained within the walls of a closed sanatorium proper, yet by virtue of special opportunities and surroundings were permitted to partake of many of its essential advantages with such restrictions concerning mode of life as appeared necessary in individual instances. Of those who resided elsewhere a conscientious effort was made to secure adequate accommodations and to enact a fitting *régime* according to the varying conditions in force.

The selection of a residence, meeting all known requirements as regards location, sunshine, porch room, frequently out-door sleeping accommodations; the wise grouping of a chosen few with reference to congeniality, temperamental peculiarities, tastes, stage

of the disease, and financial ability; the presence of a competent housekeeper, or occasionally a nurse as well, and finally a continuous, if often indirect, medical oversight, has afforded a combination sufficient to produce satisfying results which cannot be here elaborated.

Recourse to occasional change in residence was made from time to time to suit the inclinations and satisfy the apparent needs of those for whom a rational diversion was indicated to break the unceasing monotony. With the advent of warm weather all for whom a possible justification was found in their condition were urged to avail themselves of the facilities presented for the enjoyment of the benefits of country life and mountain air. Appropriate accommodations at an altitude no higher than Denver were offered at an attractive mountain resort, special arrangement annually being made by me for those whose physical conditions would scarcely warrant sojourn at increased elevations. Thus 52 spent the summer at Welch's Resort, near Lyons, upon the banks of one of the finest trout streams in the State. A trained nurse was in constant attendance, more as insurance against accident than because of actual need. Special nurses were employed as necessity demanded.

For the benefit of those for whom a residence in a still higher altitude during the summer months seemed plainly indicated, a careful provision was made, as is my custom each year, at Estes Park, at an altitude of 7500 feet. All available and properly located cottages were engaged in advance, and finally apportioned among the patients according to the various groupings of the improvised families. Competent persons were employed to assume the responsibilities of housekeeping, and not infrequently trained nurses were retained either by individuals or by several jointly; 19 participated in the joys of housekeeping at the park. For others, numbering 50, comfortable hotel accommodations were retained early in the season.

It is not inappropriate to add that from among the very large number of cases sent to Estes Park during the past six or seven years there has resulted but one hemorrhage and one death, and that in the same individual, resulting from an obvious palpable

indiscretion. All patients at these two mountain resorts were seen by me at regular intervals (once a week), with such precautionary advice and admonition as appeared called for by the exigencies of the situation in each instance.

Brief allusion may be made to the conditions which justify sending patients home. This has been advised definitely for all who could be embraced fairly under the category of hopeless cases, unless considered inexpedient for good and sufficient reasons. During the past few years permission to return home for a temporary period at a suitable time of year has been accorded frequently to special cases responding favorably to climatic change, yet not strictly reaching the stage of arrest. A permanent return for those who have secured ultimately an apparent arrest of the tuberculous process is offered upon the basis of the degree of risk and responsibility the patient personally is willing to assume. The invalid is made to realize that in spite of his great improvement a certain element of danger must attend his return. It rarely has been my practice to indorse more than a temporary return, save after six months' residence in Colorado, following the physical and constitutional evidences of total arrest. It has been my custom to make the consumptive understand, if possible, that once the tubercular infection has become clearly active or extensive, no matter how complete the subsequent arrest, his life necessarily becomes changed in many of its essentials in any climate, and that a continued residence in a favorable region imposes, finally, less of sacrifice and suffering.

WHAT SHALL WE DO WITH PATIENTS HAVING PULMONARY TUBERCULOSIS?

By FREDERICK I. KNIGHT, M.D.,
BOSTON.

The modern method of treatment of pulmonary tuberculosis may be said to have had its inception more than fifty years ago. It then began to be appreciated that great benefit came to certain consumptive cases by a generous diet and out-door life; and horse-back, camp, and other out-door means came to be quite generally recommended by the profession. While the results were good in some cases, they were not usually curative, because the gravity of the condition was, as a rule, recognized late, and also because no restriction was put upon the amount of physical exercise which the patient should take, and many a one rode or tramped himself to death.

The plan of keeping patients under control in an institution was carried out as early as 1839 by Dr. George Bodington, of Warwickshire, England, who took a house near his own for this purpose, and gave practically the same treatment as is in vogue to-day, including fresh air day and night. He was followed by Brehmer in 1859, and later by Dettweiler, the latter of whom insisted on the importance of rest rather than exercise in most cases. Koch's discovery of the bacillus gave a decided encouragement and impetus to the treatment of pulmonary tuberculosis, inasmuch as it showed that many cases cured in their incipiency were really tuberculous which might otherwise have been considered doubtful.

We may consider the modern method of treatment to be fresh air, generous diet, often complete rest, and expert supervision, the latter being especially important.

How can we best secure these to our patients?

In considering this question it will be well to divide the patients into three financial classes: (1) those who are abundantly able to pursue any course recommended without regard to expense; (2) those who can afford only limited time and money; (3) those who must depend entirely on charity.

It will be well also to divide the cases, somewhat arbitrarily, of course, into three pathological classes: (1) the incipient; (2) the somewhat advanced, and (3) the far advanced; and to consider the question what to do with a patient of either of the three financial classes, according as he falls into one or other of the pathological classes.

I will not attempt to draw a strict line of classification in either regard; the majority of cases will fall naturally into one class or another financially and pathologically, and it would be impossible to discuss at this time those which may fall near the borderline.

We will consider first the patient who has incipient pulmonary tuberculosis and who is abundantly able to do anything or go anywhere to recover his health. Now, in such a case it is not necessary to be positively sure of the diagnosis of a pulmonary affection by the crucial test —*i. e.*, the discovery of Koch's bacillus in the sputum—of course, we examine for it, but those cases, which are, in my opinion, doubtful, only suspicious, may for the sake of safety be treated as if the diagnosis was positive. These cases which are doubtful may be briefly mentioned here. They may show debility, and may or may not cough, with or without expectoration (if present, free from bacilli), but on examination of the chest there may be found localized at the apex of the lung a few rales. These are, perhaps, the most suspicious of the doubtful signs, and, if we know they have developed recently in connection with cough and, perhaps, fever, they are pretty sure to prove tuberculous, due, perhaps, if there is no sputum, to tuberculous pleuritis, as was long ago insisted by Leaming. Then, there are the various slight modifications of the percussion note and respiratory murmur. Of course, it is not necessary to tell the expert that slight relative dulness at the apex of the right lung is nor-

mal, yet it is not infrequently pointed out to me by physicians as important.

A great deal of stress is laid upon the variations in the respiratory murmur, the prolonged expiration (it must be strictly borne in mind also that the expiratory murmur at the right apex is relatively considerably longer than at the left in health), and the interrupted or deferred inspiratory murmur; but these signs are not enough for a positive diagnosis, neither is the shadow nor impaired expansion, as shown in the *x*-ray picture, or any other sign indicative of slightly increased density; they are suspicious, but not diagnostic. The tuberculin test, even if it could be relied on to denote the presence of tubercle in the body, does not show that it is pulmonary. It may be asked if it makes any practical difference, if tubercle is present in the body, where the process is located. It certainly does, for tuberculosis of the respiratory tract is usually much more serious and requires more prompt and radical treatment than that of other parts; in fact, in some other regions it seems frequently to remain latent for a lifetime. I am willing to concede a probable diagnosis of tuberculosis of the respiratory tract from a combination of early signs and symptoms, but I do not think we are justified in classifying such cases as positively tuberculous without the presence of Koch's bacillus in the sputum. I think they should be put into a class by themselves as "probable incipient cases." Be it understood, however, that I approve of treating such doubtful cases as tuberculous.

There is another class of cases seldom met, perhaps, but which do exist, and which may be mentioned in this connection. I refer to patients who present no clinical signs or symptoms of respiratory tuberculosis, yet in whose expectoration tubercle bacilli are accidentally discovered. If this condition is persistent, I do not hesitate to say that patients having it should be put at once on restorative hygiene. I recall one such case, in which my advice was rejected, in which after a few years the patient, one of the first financial class, abundantly able to take care of himself, broke down with serious pulmonary tuberculosis.

What shall we do with a patient with incipient disease who is willing and able to pursue any course we recommend?

I have said that the essentials of modern treatment are fresh air, day and night, generous diet, often complete rest, and expert supervision. Shall we try to give him these at home? Even if his home is well situated in the country, it is better not to do so; in fact, it is well-nigh impossible to carry out the fresh-air treatment at home. He may sit on the piazza for an hour or two, but very few will be found to sit out alone all day while the family are gossiping around the fireplace inside. Then, of course, the temptation to do business or other things, now prejudicial, is ever present. Such a patient should go to a community of such patients where a hygienic mode of life is the rule. Here he can have his own house and family, if he likes, but the general tone of the place will make him follow the directions of the physician, and he will find plenty of company in the out-door life. Many of these communities have started up about sanatoria because the location of the sanatorium is supposed to be especially selected for its salubrity and because patients can here have the advice of the experienced physicians of the institution. As a rule, a patient of the first financial class can have more comfort and luxury in his own home, but occasionally we meet one whom it is hard to control and who will do better in a sanatorium. When he has learned the habits of such a place he may, if he recovers, carry out many of them in his own home.

It is not my purpose at this time to consider special climatic conditions with reference to bronchial irritability or the general nutrition and vitality of the patient, though this is important, very important in some cases, but not entitled to so much consideration since it has been shown that tuberculous patients may recover by means of out-door life in any climate. Still the same climatic conditions do not suit all patients, and, when possible, they must be considered with reference to each individual case.

Of transcendent importance, however, is skilled supervision. Many a life has been sacrificed of patients dispatched to a climate where out-door life is pleasant, who followed their own inclination in everything, and thought their mere presence in the region was all that was necessary, even if half their time was spent in

hotel bar-rooms and though they did ride horseback with a body temperature of 103°.

In the present state of our knowledge we should commit our patient, if possible, to an expert of sufficient experience and wisdom to refrain from unnecessary medication, especially vaunted specifics, but who has sufficient knowledge of general medicine to discover and treat underlying conditions, which may have predisposed to the disease, and which may still be aggravating it.

The same course should be pursued with a patient of the first financial class who comes in the second pathological class, though, of course, he must plan for a much longer stay. If a patient of the first financial class falls into the third (or far advanced) pathological class, the question will be whether he should be made as comfortable as possible at home or make a new home in a better climate for the rest of his life. This depends a good deal on the temperament of the patient, his love of home and old ties, his sensitiveness to temperature changes, and also on the possible existence of an irritable bronchitis which may be constantly aggravated in a harsh climate, and be very much soothed in a milder one.

I shall never forget the gratitude of one patient who went away knowing he would not return, but grateful for the comparative comfort of his last days.

What shall we do with a patient of the second financial class (of moderate means) and of the first pathological class (incipient)?

It is hardly necessary to repeat that all incipient cases are better treated away from their homes. A good private sanatorium is the best place for most patients with incipient disease who fall into the second financial class. It would usually be well that it should not be very distant from home, in order that the patient may be visited by his family occasionally, and also return at times, with the consent of the authorities, for necessary business. A patient of moderate means with far advanced disease, as a rule, had better husband his resources for comfort at home.

And now comes the question, the most important, perhaps, for the welfare of the community, What shall we do with the third financial class—the patients dependent on charity? Sanatoria

and hospitals are what are needed for these patients, of all classes pathologically, and the institutions should be absolutely free and not hampered with small fees or a declaration of poverty. A beginning has been made, but the ideal condition will not be realized until a poor tuberculous patient in any stage of the disease can have free hospital accommodation. And I believe that the isolation and control and treatment of all such patients, often ignorant and careless, will be an economy, as has been often pointed out before, to the State or city which provides for them.

If the poor are obliged to remain at home on account of lack of accommodation in our institutions, it is of the utmost importance that they should be visited repeatedly at their homes until the family become thoroughly familiar with the hygiene and prophylaxis of the disease.

And now, again, I must say a parting word on medication: judicious medication can do so much good, and routine injudicious medication so much harm. No medicine, be it cod-liver oil or creosote, or any other supposed specific, is to be encouraged for a minute if it impairs the appetite or digestion of food. The patients who come to us consultants suppose we know the treatment to which we commit them when we send them away from home, and I think, perhaps, we have been too careless in not knowing more about it than we often do. I was much impressed by what was once told me by a distinguished alienist, that he never sent a patient to an institution that he did not visit him regularly. In this case he felt a continued responsibility for his patient's restraint, which would differ from the responsibility in our case, of course, but we should have a pretty good general idea, not only of the locality to which our patient goes, but of the treatment to which he is to be subjected.

THE WORK OF THE TUBERCULOSIS CLINIC OF THE HEALTH DEPARTMENT OF NEW YORK CITY.

By THOMAS DARLINGTON, M.D.,
COMMISSIONER OF HEALTH, NEW YORK CITY.

The clinic for the treatment of communicable pulmonary diseases of the Health Department of the City of New York was opened on March 1, 1904, for the diagnosis and treatment of pulmonary tuberculosis among the poor of the city.

The clinic is situated in a one-story building, constructed especially for the purpose, adjoining the Health Department building, at Sixth Avenue and Fifty-fifth Street. It contains a registration-room, two waiting-rooms (one for men and one for women), two dressing-rooms, two examining-rooms, a throat-room fitted with all the apparatus necessary for the treatment of laryngeal tuberculosis, and an *x*-ray-room. It is constructed in the most approved manner of hospital construction. The floors are tiled, the corners of the rooms are rounded, and the furniture made of heavy plate glass and white enamelled iron, so that everything about the clinic may be kept thoroughly clean. The nurses wear the regulation white uniforms, and each attending physician is supplied with three suits of washable white duck. In this way the danger of carrying germs in clothing is eliminated. The patients learn of the existence of the clinic from different sources. When it was about to be opened announcement of that fact was made in the public press, in newspapers printed in foreign languages, as well as in the regular dailies of the city. The various hospitals, dispensaries, and charitable societies of the city were also notified to the same effect.

It is intended that when a patient who has tuberculosis is discharged from a general hospital he will be given a card to the Tuberculosis Clinic, where he will be examined and treated.

The Health Department has a system of inspection by trained nurses or physicians whereby the tubercular patients can be visited in their houses, their financial and sociological conditions investigated, and instruction in the methods for preventing the spread of the disease given to the patient and members of his family.

By this method of inspection cases that have been to the clinic and found to be true cases, and who have for some reason ceased their visits, are looked up, the reason for their non-attendance ascertained, and, if possible, they are sent back to the clinic to continue their treatment, unless they are too sick to go, in which case they are sent to a hospital.

When a case is referred to the clinic from a dispensary or hospital a card is sent to the Health Department stating that fact. (See A.) This card is kept in the office of the clinic for one week. If at the end of that time the pateint has not arrived for treatment a nurse is sent to investigate and find out the reason for his failure to attend.

When the patient comes to the clinic he enters the registration-room, where, even before his history is taken, he is given a pasteboard sputum-box and a piece of gauze. He is instructed as to the danger to others from his expectorating on the floor or sidewalk, is told to expectorate into the sputum-box, which can be burned, and to hold the gauze before his mouth when he coughs.

His history is then taken by the registration nurse, a printed form being filled out (see B), special care being taken to bring out any family or personal tubercular history or possible infection from contact. He is then sent in his turn to a dressing-room, where he removes all of his clothing to the waist, then goes to the examining-room, where a thorough physical examination is made by the attending physician. His weight is taken and entered on the history card, the general appearance, condition of the mucous membranes, skin, fingers, and shape of the chest are noted. Next the circumference of the chest is measured, and the amount of expansion he is capable of is ascertained. In some cases the

contour of the chest is marked out on paper with the aid of the cyrtometer, and the lung capacity tested with the spirometer. Supraclavicular and infraclavicular and sternal depression are noted and shown on the history card.

Next an examination of the lungs and heart is made, and any morbid physical signs are written on the examination card, as well as marked graphically by signs and abbreviations on diagrams of the chest stamped on the back of the card. (See C.) The patient is then instructed as to the hygienic and dietetic measures he should observe; he is told to remain in the open air as much as possible, to sleep with his windows open at night, to sleep in a separate bed and room if he can. He is told to drink certain quantities of milk and eat a certain number of raw eggs (depending on each individual) a day. He is taught breathing exercises as recommended by the associate director of the clinic.

A printed circular relating to tuberculosis is given each patient; this circular is printed in several different languages, even in Chinese. The patient is given a sputum-glass, into which he expectorates before leaving the clinic, if possible; if not, after he gets home, in which case the sputum is brought or sent to the clinic later. This sputum is sent to the Health Department laboratory, where it is examined for tubercle bacilli, the results being sent to the clinic and entered on the history card. Cases which show a negative sputum are examined three times before they are considered non-tubercular; even then, if the physical examination shows sufficient signs, the case is treated as a true one. The absence of tubercle bacilli is not considered positive proof that the patient has not pulmonary tuberculosis.

Some cases are brought to the *x*-ray-room for examination; as yet in the clinic the *x*-ray has been used only as a diagnostic aid and not as a therapeutic measure.

Cases of tubercular laryngitis or laryngitis with pulmonary tuberculosis are sent to the throat-room for examination and treatment. Patients with an abnormal temperature or those too sick to walk are sent to a sanatorium or hospital, either to Riverside Sanatorium on North Brothers Island (which belongs to the Health Department), Seton, St. Joseph's, or Lincoln Hospitals.

A.

(Always bring this card.)

CLINIC FOR TREATMENT OF PULMONARY DISEASES.

DEPARTMENT OF HEALTH.

967 Sixth Avenue, near Fifty-fifth Street.

Borough of Manhattan. New York.
Name
Address
Date No.
Days Hours.

B.

DEPARTMENT OF HEALTH, THE CITY OF NEW YORK. TUBERCULOSIS DISPENSARY.

Name Age M. F. No.
Address Floor Date 190
Occupation M. S. W. Color Nationality
Final Diagnosis D. R.
F. H. F. M. B. S. Gf. Gm. U. A. H. W. C.
P. H. Childhood Measles, Pertussis, Pneumonia, Pleurisy
Injury Alcohol Syphilis
Tobacco Other Habits
Char. Residence No. in family

P. I. Complains of
Began with Duration
Weight Max. Present Appetite Digestion
Cough Expectoration Hæm.
Night Sweats

C.

P. S.
Mucous Membranes Tongue Temp. ° F.
Thorax. Shape Capacity
Lungs
Cavity
Heart. Pulse Rate Quality
Vessels
Apex Beat
Sounds
Abdomen.
Glands Skin Fingers
x-rays
Urine
Sputum
Treatment
Assigned to Nurse

Since the opening of the clinic 960 patients were examined and treated. These patients made 2697 visits, a daily average of 35.5. Of this number 388 were Russian Jews, and 183 worked in tailor (sweat) shops. Most of these people live and work in crowded and badly ventilated houses and shops, and they show a larger percentage of tubercular cases than any other nationality or occupation.

The following table was prepared by John S. Billings, Jr., M.D.:

TOTAL CASES TREATED FROM MARCH 1 TO MAY 31, 1904.

New patients:		
Male	671	
Female	289	
Total new	—	960
Old patients:		
Male	1232	
Female	505	
Total old	—	1737
Total patients' visits		2697
Daily average		35.5
Nationalities:		
Russian (Jew)		388
United States		182
Various		140
Austrian (Jew)		91
German		81
Irish		64
Colored		14
Working in tailor (sweat) shops		183
Family history		212
History of contact		131
Patients found tuberculous, sputum positive		189
Patients showing symptoms and physical signs, sputum negative		157
Patients referred to hospitals or sanatoria, true cases		107
Patients referred to dispensaries or under treatment by private physicians		270
Patients not found by inspector at address given, of these 48 show physical signs and symptoms		104
Patients now under observation		471
Sputum examined		618
Sputum found positive		189
Sputum found negative (specimens)		713

902 specimens, or 1804 microscopic preparations were examined in the Diagnosis Laboratory of the Department.

Of course, many of the patients who are treated at the clinic are in such poor financial circumstances that they cannot carry out the physician's instructions as to hygiene and nourishment. What a great many of them really need more than medicine is

food, and they are unable to buy it. It is the intention of the Department to supply deserving patients with milk and eggs, but as yet it has not been found possible to do so. At present this difficulty is overcome to some extent through the aid of the Charity Organization Society, the United Hebrew Charities, the New York Diet Kitchen, and the Society for the Improvement of the Poor. These societies supply a number of our patients with extra nourishment.

There is no routine treatment followed out in the clinic, each attending physician using whatsoever he prefers. As a general rule, the treatment may be said to be mainly symptomatic, hygienic, and dietetic.

HOME TREATMENT OF TUBERCULOSIS BY MEANS OF HOSPITAL DISPENSARIES.

By JOHN W. BRANNAN, M.D.,
NEW YORK CITY.

The gentlemen who were present at the meeting of this Association last year will remember the paper by Dr. Otis on "Dispensaries for Tuberculosis," and the interesting discussion to which it gave rise. Unfortunately for myself, I was not present at the reading of the paper, but entered the room as the discussion was closing. Dr. Otis, however, kindly sent me a copy of the paper soon afterward, and I was so much impressed by it that I at once set about establishing clinics for tuberculosis in the outpatient departments of Bellevue and its allied hospitals. At that time cases of tuberculosis in those hospitals, as in hospitals generally, were treated by those in charge of the general medical clinics. Dr. Otis and some of the other speakers last year referred to the difficulties they met with in organizing a special dispensary for tuberculosis. The chief difficulty in my experience was in finding properly qualified men who were willing to devote themselves to a clinic limited to tuberculosis alone. Finally, however, I succeeded in securing the man who was probably the best fitted of any physician in New York to take up this new work, Dr. James Alexander Miller. Dr. Miller, some six months before, had established at the Vanderbilt Clinic, at the instance of Dr. Walter B. James, a system of more careful management of cases of tuberculosis than had before been customary.

The main features of this system were special histories and regular weekly records of all cases, detailed oral and printed

instructions in regard to the disease, free distribution of sputum pouches, and a visiting nurse, who made written reports of the home conditions and co-operated with the physician to make these conditions conform, as far as possible, to the hygienic requirements for the treatment of this disease. With the kind permission of Dr. James, who recognized the larger field we had to offer, Dr. Miller came to Bellevue. He brought to us not only the experience acquired by him in the Vanderbilt clinic, but also the interest and enthusiasm which, as Dr. Otis has said, are so necessary in this work. In return, we have placed all the resources of the hospital at his disposal, so that, in addition to the means made use of at the Vanderbilt clinic, he is supplied with milk and eggs for such patients as cannot afford to buy the extra nourishment required, and also the tent cottage that is shown in the photographs. The tent is in the open grounds of the hospital, upon the banks of the East River, and is designed for those patients whom it is desirable to keep in bed because of elevation of temperature or for other reasons, or for whom a few weeks' training in habits of life seems desirable.

Dr. Miller has recently prepared a report of the work of the tuberculosis clinic for the first four months of this year, to be published in the *Annual Medical and Surgical Report* of the hospital, and a summary of his observations may be of interest.

The objects of the tuberculosis clinic as stated by him are as follows :

1. *Careful and thorough medical attention* to each patient in a separate clinic by physicians especially interested and experienced in this disease.

2. *Systematic investigation and supervision of the home conditions* of each patient.

3. *Education of the patients and their families* in the principles of good hygiene and the prevention of the spread of infection.

4. *The study of the social and economic conditions* in connection with the medical aspects of each case, and the relief and amelioration of those which are unfavorable.

5. *The opportunity for scientific investigation* and clinical experience for physicians and students.

Taking up these objects in turn, let us see what has thus far been accomplished :

1. *Careful Medical Attention.* When a patient is referred to this clinic he is sent to a separate room for tuberculous patients, the temperature and pulse are noted by the nurse in attendance, and the history is taken by one of the physicians upon special forms upon which all the points to be investigated are printed. A careful examination is then made, including chest measurements, laryngeal examination, if at all indicated, and careful weighing with the patient stripped to the waist. The results of this examination are recorded on the history sheet, the physical signs by the graphic method. A positive, or even probable, diagnosis being made, the name and address are given to the nurse as a case to be visited. The sputum is sent to the Department of Health for examination. The patient is informed of the nature of his disease, of the principles of its treatment, and the dangers of infection, and printed circulars of instruction are given him for reference. The general principles of fresh air, rest, and extra nourishment are explained in detail. As a rule, the diet advised is a mixed one, with two quarts of milk and four raw eggs additional each day. This number is gradually increased to the point of increase in weight or the tolerance of the individual, but the maximum quantity prescribed is about three quarts of milk and eight to ten eggs daily. The amount of fresh air and rest that these patients can obtain is, of course, very variable. It is almost always less than is desirable, but by persistent emphasis upon their importance much can often be accomplished.

Medication plays a minor role in the plan of management. Cathartics are most necessary during overfeeding, and stomachic tonics are very useful. Cod-liver oil is given freely as a food during the winter months. Creosote is very seldom prescribed. Symptoms such as distressing cough, pain, night-sweats, etc., must be relieved. The general principle, however, is to use as little medication as possible. Pocket sputum pouches, and more substantial ones for home use, are given to each patient from the drug-room. Patients are requested to return to the clinic once a week, and a record of their weight, temperature, pulse, and

general condition is made at each visit. Careful physical examination is made at least once a month, but, of course, as much oftener as any indication suggests.

2. *Thorough investigation and supervision of the home conditions* of each patient. This is best accomplished by means of visiting

Fig. 1.

Bed-room from which patient was removed to (Fig. 3), same apartment.

nurses who have had special training in district nursing as well as hospital work. At Bellevue there are two such nurses, Miss Damer and Miss Hopkins. Both are graduates of the Bellevue Training School, and both have been active and successful in dis-

trict work, the former with the Buffalo Charity Organization Society, the latter with the Charity Organization Society of New York. Under their direction one of the pupil nurses also helps in this work, which thus becomes a part of her training. Each new case is referred to the nurse with any special instruc-

Fig. 2.

Air-shaft supplying light and air to bed-room in Fig. 1, at bottom of this shaft.

tions or information that may be thought advisable, and, after a thorough inspection of the home, a report is made out by her upon printed forms provided for the purpose and submitted to the physician in charge of the case, together with any suggestions which may occur to her as a result of her visit.

The general plan is to arrange the whole domestic economy to

the best interests of the patient, and to provide against the dangers of infection to his household and associates. Careful and detailed instructions are given as to ventilation and the principles

Fig. 3.

Bed-room to which patient was removed from Fig. 1.

Fig. 4.

Patient on fire-escape.

of the fresh-air treatment, and practical demonstration is made of the proper method of disinfection of the bedclothing, eating utensils, and personal linen of the patient; also any necessary suggestions are made along the lines of general cleanliness and better hygiene. Thorough inquiry is made concerning the care which the patient habitually takes of his expectoration, and notice taken of the general attitude of the whole household toward the instructions given at the clinic. Investigation is made into the

Fig. 5.

Patient on fire-escape. (See Fig. 4.)

available facilities for taking a "rest cure" out-of-doors, and the fire-escape, the roof, and the nearest park are all considered from this point of view, and the results incorporated in the report. For a few patients we have been able to secure sleeping-bags, reclining-chairs or hammocks, so that they may stay out-of-doors almost continually. (See Figs. 4, 5, 6, and 7.) The family resources are also noted, and recommendations for assistance are made accordingly. Oftentimes the "home" is absolutely un-

suited to our purpose; if so, it is so stated, and the actual conditions existing are described. Figs. 1, 2, and 3 show how the home conditions of the patient may be bettered by simply moving him from a dark interior bed-room to the sunny parlor of his own apartment.

3. *The education of the patients* and their families in the principles of good hygiene and the prevention of the spread of the infection. How this is accomplished by the constant reiteration of sound advice from physicians, nurses, and printed circulars is apparent. During the past four months our nurses have visited 138 patients, whose aggregate families number 621. Each one of these individuals is now a centre of information in regard to the general principles of healthful living.

Fig. 6.

Patient in hammock on roof.

4. *The study of social and economic conditions* obtaining in each case. This means the correlation of all the available data obtained from the investigations of the physicians and of the nurse. Upon this study the physician bases his method of management of each case. This involves upon the part of the physician an intimate knowledge of all available resources. In our work we keep in close communication with all the sanatoria and hospitals which admit tuberculous patients, and attempt to send suitable cases to the institutions best adapted to their needs. The regulations of the Health Department and Tenement House Department are studied and observed. The facilities offered by the Charity

Organization Society, the United Hebrew Charities, the Association for Improving the Condition of the Poor, the various churches and religious societies, the Diet Kitchen Association, and the Strauss Milk Depots are all well known and constantly utilized. In addition, milk and eggs from the hospital storeroom are given free to such patients as are found to be unable to sufficiently provide for themselves. Lately a tent cottage has been erected upon the hospital grounds, accommodating twelve

Fig. 7.

Patient in extension-chair on roof.

patients, which is for the use of those patients in the clinic whom it is desirable to keep under observation temporarily, or for favorable cases for whom proper sanatorium or home treatment is not possible. The proper use of all these means is an essential portion of the treatment, and the responsibility for it rests with the physicians, from whom it requires careful study and judgment.

5. *The opportunity for scientific investigation* and clinical experience for physicians and students. This portion of the work has not yet been developed. It is proposed to take it up systematic-

ally next autumn, and it is hoped that tuberculosis will be studied in this clinic along various lines.

The activities of Dr. Miller have been, in the main, limited to Bellevue, but we have fortunately been able to find capable and well-trained physicians to take up the work at some of our other hospitals. This is particularly true of Gouverneur, where a tuberculosis clinic was organized last October by two young women physicians, Dr. Stella S. Bradford and Dr. N. G. Seymour. As a result of their efforts the number of cases has grown from one or two a day to ten to twenty a day. During the month of April twenty-four new cases were enrolled. The methods of manage-

Fig. 8.

Tent at Bellevue, showing proximity to river.

ment are very much the same as at Bellevue, except that we have not as yet obtained a trained nurse to visit the patients regularly at their homes; but we hope very soon to supply this deficiency.[1] Dr. Bradford has just submitted a report on the work at Gouverneur, which will be published in our annual report, along with that of Dr. Miller. Working under trying conditions that would have disheartened most men, she and her colleague have accomplished results almost equal to those obtained at Bellevue. In commenting upon the intelligence of some of the population of the East Side, Dr. Bradford cites the cases of the man who, with

[1] Since this paper was read an experienced nurse has been assigned to Gouverneur Hospital.

perfect equanimity, upset his sputum bottle in his pocket, and the woman who on being told to hold her hand before her face when she coughed, promptly spat into it!

At Harlem Hospital, where the dispensary service is very heavy, a separate clinic for tuberculosis was opened three months ago, but the number of patients does not yet compare with that at Bellevue and at Gouverneur. Fordham, our fourth hospital, lies in the outskirts of the city, where there are but few out-patients, and no attempt has yet been made to separate the tuberculous from the other patients. We have asked Dr. Miller to supervise the work at all four hospitals, so that each may profit by the experience of the others, and at our meeting of next year I hope to present a report of the work more worthy of your attention than these rather disjointed notes of to-day.

Fig. 9.

Tent at Bellevue, looking west.

I have been asked to say a few words as to results. Of course, it is too early to talk of cures, or even of arrested cases, under a system of treatment which has been in force less than a year, and with cases numbering less than three hundred. At Gouverneur, of the patients who have been under continuous observation, two-thirds have shown a gain in weight, and to-day I received a letter from Dr. Miller in which he stated that of the patients in the tent cottage at Bellevue all but one had gained from six to fifteen pounds in weight, with a corresponding improvement in all the other symptoms. The woman photographed in the steamer-chair on the fire-escape had gained fourteen pounds in six weeks,

though she had been considered a hopeless case. When, in the course of the next year or two, we shall be prepared to make a report, the results will no doubt be such as have been obtained elsewhere from the use of fresh air, rest, and extra nourishment, combined with special study of the conditions of each individual case.

DISCUSSION ON PAPERS OF DRS. BONNEY, KNIGHT, BRANNAN, AND DARLINGTON.

Dr. Minor: There are several things in Dr. Bonney's paper that struck me as very practical, having met the same problems every day. The question of the location of our patients in the health resort is one that bothers many doctors in resorts. I have talked it over with gentlemen from various places, and all come to very much the same conclusion, that, on the one hand, it is impossible with modern American patients—the patients of the upper class—to satisfactorily manage sanatoria for the socially well-to-do, and at the same time it is important in locating your patients that they be not subjected to the harmful influence of those who live an unregulated life and who are attempting constantly to do the wrong things; and in talking with a number of gentlemen I find that they have all come to making use of certain houses located as they approve and managed as they approve as regards hygiene and table, and where they feel that their patients will not be free to walk as much as they please, to go out at night and drink and run around town just as an ordinary man would, but who have the exceptionally strong influence of the example of the other patients to keep them within bounds. I know when I place my patients at other houses I was constantly seeing the bad example of their quoting to me other people who did just as they pleased in various ways. Now I have taken to putting them, on the contrary, in houses where I know how the patients live, where there are largely my own patients, and where I have already patients who are well trained. It is wonderful how they will influence each other and help each other and guard each other in what they have to do, and in this way I believe that you get many of the advantages and few of the disadvantages of closed sanatoria.

I was glad to see Dr. Knight divide his classes as he did as regards their financial and medical status, and I have sometimes felt it was also necessary in locating patients to divide them according to the social status. It is remarkble how difficult it is for us to satisfy or manage patients of different social degrees if you try to put them in the same house. The classification that the doctor made was most practical, and I think meets the situation as we all see

it in health resorts more fully than anything else on the subject that I have heard.

Dr. Otis: While expressing my appreciation of all these most suggestive papers, I wish particularly to say a word or two with regard to those of Drs. Brannan and Darlington. In establishing tuberculosis dispensaries in New York, as these gentlemen have done, I believe they have instituted a movement in their city which is bound to be of the highest value in the prevention, control, and relief of tuberculosis. It is a movement, moreover, which some cities have already followed, and which all in time, I believe, will follow. It is a most reasonable and practical method of dealing with ambulatory cases of pulmonary tuberculosis among the poor in our cities. Separate and special buildings for this purpose, such as Dr. Darlington has referred to as now existing under the supervision of the Board of Health in New York City, or that of Dr. Calmette, at Lille, France, the pioneer in this kind of work, have their advantages over tuberculosis clinics held in conjunction with and under the same roof with other special clinics, as is now, for the most part, the case.

With a special and separate establishment more room, better equipment, and better service are attainable, although the medical and maintenance expense is necessarily greater.

One of the most important and valuable features of such a dispensary or clinic, as Dr. Brannan has emphasized, perhaps the most important, is the so-called social side—the investigation of the consumptive at his home by the dispensary visitor or "visiting nurse." Thus the work of the dispensary physician is supplemented, and he is kept in touch with his patient and has direct knowledge of his environment and home care. As to the matter of obtaining physicians or assistants who are enthusiastic in their special work, and are willing to devote themselves to it, it is sometimes difficult, doubtless, to find such. In my own case two of my assistant physicians are also clinical assistants in my department of pulmonary diseases at the Tufts Medical School, and consequently, being obliged to give clinical instruction, they take greater interest in the clinic, and are stimulated to make original investigations.

Dr. B. F. Lyle: I think one very important fact in regard to the success in the treatment of consumption has not been touched upon, and that is the difficulty we have of getting these cases sufficiently early. I think in our Cincinnati Hospital, since its organization about seven years ago, we have admitted about seventeen hundred cases; but the very large majority of these cases are advanced. Last Saturday out of six cases admitted four were cavity cases. None of these cases gave a history of being sick over two months. In one of the cavity cases the patient stated he had been sick for two weeks; and you will find that one serious difficulty that interferes with successful results is the tardy recognition of the true condition of the patient. It is likely the fault

largely rests with the profession—the general profession—who do not give cases of this kind a sufficiently careful examination and allow the patients to neglect themselves. This may continue for such a length of time that when they do go to a competent physician the time has already expired when anything can be done of a successful nature.

Dr. McGahan: Just one word that comes under Dr. Knight's paper. He speaks about the care of our patients who have the means of staying with their families. I had an instance of one case of a man of means who lived out-of-doors all the time. He had a house arranged in which the piazza was built in on both sides, so as to protect him from the wind, leaving it entirely free in front. Now, before the family came down, that man slept out-of-doors on that piazza with perfect comfort every night. He had been over two months there, but when they arrived he was out all day and put on his dress suit for dinner at night and staid in with them until about 10 o'clock, yet he could not sleep out-of-doors at night. I think we have got to keep our patients out all the time; we cannot have them in part of two or three hours in the evening and then have them sleep out at night.

Dr. Klebs: I only wish to ask Dr. Brannan a few questions. Concerning especially the disinfection of bedclothing, do they have special appliances at Bellevue for taking care of bedclothing in the houses, and what do they do with the mattresses? We find in Chicago a great deal of difficulty in doing that. You all understand that Calmette in his dispensary has a special provision for disinfecting laundry, bedclothing, and mattresses. It would be interesting to know if this valuable service is duplicated in this country.

I was very glad to hear Dr. Darlington speak about following up cases in their homes. This important point must be emphasized more and more. I believe that the more pressure we bring to bear on the infected family through nurses, through physicians, and also through especially trained lay people, the better our results will be.

There is also another question which I should like to ask. What is there done in the way of giving appropriate employment to the apparently healthy members of a family in which there is one or more cases of tuberculosis?

I do not mean to those with manifest tuberculosis, but when they are suspected, and especially children, delicate young men and women, is there anything done in this most important direction in New York? We are attempting something on that line in Chicago and co-operating with charity agencies and the Park Board, and also with farmers in the country. I believe that all these points are of great importance, and I should be very glad to hear what these gentlemen have to say.

Dr. Brannan: All the disinfecting is done in New York by the Board of Health. We have nothing in the hospital, and all that sort of work has been by the Health Department.

Dr. Darlington: In the matter of disinfection of mattresses, bedclothes, and so on, this is all taken away in ambulances to different places in each borough. We have several places in Manhattan, and we also have several places in each of the outlying boroughs where there is a steam plant and also formaldehyde, and they are heated to 240° under pressure. We disinfect everything from every reported case of tuberculosis that we can get hold of.

I would like to say that you gentlemen are giving me quite a little credit for this clinic. Most of it belongs to Dr. Brannan and Dr. Brooks, who were associated with me under the department with my predecessor, not myself. I do not want to take any undeserved credit.

I would like to say that any of the literature that belongs either to Dr. Brannan's department of the hospital or any circulars that we have here on which there has been a great deal of time spent, we would be glad to send any number of copies; or if, for instance, these plates, such as those written in foreign languages, should be desired, I would be glad to loan them.

THE AGNES MEMORIAL SANATORIUM.

A DESCRIPTION OF THE SANATORIUM FOR THE TREATMENT OF PULMONARY TUBERCULOSIS, BUILT AT DENVER, COLORADO, BY MR. L. C. PHIPPS.

By CARROLL E. EDSON, A.M., M.D.,

AND

W. H. BERGTOLD, M.Sc., M.D.,

DENVER, COL.

The Agnes Memorial Sanatorium has been erected at Denver, Colorado, by Mr. Lawrence C. Phipps, of Pittsburg, as a memorial to his mother. An attempt has been made to have it in every detail the most thoroughly built and equipped institution possible, and Mr. Phipps has spared no expense to this end. An account of the plans and construction of the Sanatorium may therefore be of interest.

Mr. Phipps, having determined upon building, for this memorial, a sanatorium for the care of persons of small resources suffering from pulmonary tuberculosis, purchased a large tract of land in the suburbs of Denver. In April, 1902, he laid his plans before the gentlemen whom he later asked to be the Trustees of the Sanatorium, which is incorporated under the laws of Colorado as a permanent charity, and before the physicians whom he had selected for his Medical Board.

The members of the Medical Board, being asked to make all necessary suggestions as to the details and requirements of such a sanatorium, gave their enthusiastic attention to this work, and recommended that the institution be conducted as a closed sanatorium for the open-air treatment of persons of small means

suffering from incipient pulmonary tuberculosis; that it be not a home or refuge, but restricted to cases of early disease in persons whose return to wage-earning is urgent and whose disease offers prospect of such arrest or amelioration within a short period as to permit of such return; that the institution should be planned to give such persons for a period of six months or so the very best opportunity for out-door living, physical quiet, abundant nourishment, and medical oversight at a small cost; that the Sanatorium also be not only therapeutic, but educational, the patients being taught how to take proper care of themselves after leaving.

After long and careful consideration, the Medical Board reported November 14, 1902, to Mr. Phipps detailed suggestions and specifications as to the arrangement and construction of the buildings. These recommendations have been closely followed in the main, Mr. Phipps making from time to time some changes in the way of additions to the simpler ideas of the Board, but in no way affecting the general plan as first laid down. The specifications were given in November, 1902, to the architects, Messrs. Gove & Walsh, of Denver, who have in every way most cordially co-operated with the Medical Board, and subordinated their architectural ideas at all times to the medical demands.

During the winter of 1902–1903 the detailed plans were worked out by the architects and physicians with great minuteness, and ground was broken in May, 1903. The erection of the buildings since then has been under the direction and in the hands of the Building Committee of the Board of Trustees, which was organized in January of that year.

The land comprises forty acres, upon high ground, seven miles east of the city of Denver, and well situated so as to be wholly free from smoke or future crowding; one hundred and twenty acres additional to the east and south are owned by Mr. Phipps, and, used at present as a ranch in connection with the Sanatorium, may be drawn upon for future needs. The site is on the line of the electric cars, giving easy access from the city, and the elevated ground commands an uninterrupted view of the mountain range to the west,

150 miles from Pike's Peak to Long's Peak, and of the plains to the east. The view from the tower of the administration building extends over more territory than the entire State of Massachusetts. The land slopes gently to the east, south, and west, and is the usual prairie oversoil with a gravelly subsoil, giving good drainage. The water supply is ample, furnished by the excellent city water of Denver and by an artesian well, 750 feet deep, upon the grounds.

It was decided, for reasons of economy in administration, especially of ease of heating in winter, to adopt the pavilion system at first, and to increase the capacity, if desired later, by the erection of cottages from time to time. The buildings are planned to accommodate now 80 patients, the administration plant, kitchen, etc., being arranged for an increase to 150 patients, which is considered the maximum number desirable under one control.

There are at present five buildings: an administration house, two pavilions for patients, a medical building, and a power and laundry plant. The main buildings are in a line, the administration building between the two pavilions and a little behind them, while the medical building is to the north of the north pavilion. The power plant is 300 feet east of the rear of the main building. The orientation was most carefully considered in regard to sun and wind, both the prevailing and the storm winds, and in view of the needs of both winter and summer life. The buildings face west-southwest, save the medical building, which is squarely on the compass. This arrangement was expected, as it has been found to do, to give every room direct sunlight every day in the year, and to provide on the verandas of the pavilions sunlight all day in winter and in summer shade from the warm Colorado sun. The working out of this took much time, but has been very successful, as will be shown in the detailed description of the sleeping pavilions.

The buildings are all of brick covered with cement and roofed with red tiles; the general effect being that of the Spanish Mission, so well suited to the western sun and landscape. The buildings are all connected by open cloisters, and below ground by a

dry, well-lighted subway for use in administration work or very stormy weather. There is a full cemented and plastered cellar under every building.

The lighting is by electricity generated in the power plant, and the heating is the "direct-indirect" system of air over steam coils, to be described in connection with the pavilions. In addition, all rooms used for general assembling have open fireplaces.

The administration building, in the centre, is 139 x 40 feet and three stories high, with a two-story L 51 feet deep. It contains the offices, library, parlors, and dining-room for the patients, the kitchen and pantries and the living apartments for all the employés from the medical director down.

The cloister connecting the pavilions runs directly in front of the main building, and by glass doors is here shut off to make a vestibule. Entering the centre hall, the dining-room, 60 x 40 feet, is on the right, where it has the full benefit of the morning sun on the east and south, the afternoon sun being to some extent shaded by the cloister on the west side. On the left are two reception-rooms, 15 x 18 feet, in which patients may meet their callers, it being the intention to allow no visiting in the sleeping pavilions. Across the side hall on the east from the reception-rooms are the office for the clerk, where patients will transact their business and receive mail, and the private office of the executive superintendent. The clerk's office opens also by a door to the rear of the building, giving easy access for delivery men to present bills of lading, etc., or for out-door employés to do business without coming through the house. The north end of the first floor is given to the library, 20 x 40 feet. In the rear wing are the superintendent's family dining-room, the serving-room, kitchen, pantries, refrigerator-rooms, and a dining-room and sitting-room for the servants. In the basement of this wing are the vegetable cellars, bakeovens for bread, and the store-room, entered from the outside on the north.

The second floor is occupied on the north wing by the superintendent's and house physicians' rooms; on the south wing by the linen and sewing-rooms, and quarters for the matron, housekeeper, and nurses. In the second story of the rear wing are sleeping-

rooms for the servants, the necessary attempt at separation of the sexes being made by dividing the corridor by a solid wall, so that the women's rooms are wholly apart from the men's.

The third story of the main building was added for architectural effect, and advantage was taken to use the south end for an assembly hall, 40 x 60 feet. This room is one and one-half stories high, the ceiling being vaulted to the roof, the double row of windows and dormers giving ample ventilation. This room will serve for occasional lectures and concerts. Objection may be made to this room being on the third floor, but the stairs throughout the Sanatorium are of very easy rise and tread, and a patient unable to go up to the hall ought not to be at any entertainment.

The north end of the third floor gives extra rooms for an increase in the number of employés.

In front of the administration building, separated from it by the cloister, are two large sun-rooms, 38 x 24 feet, for use in severe cold or occasional hard storms in winter when a porch is too exposed. The sides are wholly of glass in French windows, and the rooms are shut from the open cloisters by glass folding-doors. The rooms are thus open on all sides to light and sun, while they may be protected from the wind wholly or on any side as may be needed. They are amply ventilated aside from the window openings.

The cloisters running between all the buildings are covered passages with wide, open arches of seven feet span. The piers are less than three feet wide. Throughout, these cloisters are wholly open, giving free circulation of air. The purpose of the Medical Board throughout all the construction was to do away, as far as possible, with confining walls and to secure the greatest abundance of light and air at all times. In case of severe storm the corridors under the cloisters may be used by the more delicate patients in passing from the pavilions to the dining-room. These passages are dry and well lighted, and serve to carry the steam, water, and wires pipes.

The pavilions, which are the essential working parts of the institution, are on either side of the main building, 70 feet distant each and 50 feet in advance. They are 160 x 65 feet, counter-

GENERAL VIEW.

MEDICAL BUILDING, CLOISTER AND PAVILION.

PAVILION.

THE AGNES MEMORIAL SANATORIUM.

parts, each two stories high, the upper story in all details like the lower. Each pavilion accommodates 40 patients.

The bed-rooms are all of the same size and arrangement, 11 feet wide by 16 feet deep, a closet 3 feet deep being taken off at one side of the inner end, making the main room 11 x 13 feet. All the rooms are 11 feet high. Over the door leading to the central hall is a transom serving to light the corridor, which is 8 feet wide, and to allow cross-airing, if wanted. Opposite this door is a window 38 x 78 inches, and next the window a door opens on to the veranda. This door is glass and is 4 x 7 feet, with a glass light above, 41 x 20 inches, so that practically the whole veranda end of the room is window, admitting abundant sunlight, which strikes away across the floor of every room at some time during the day.

It will be noticed on the plan that the window of each room is opposite the inner door and transom, permitting full airing across the room, but leaving the bed, which stands opposite the outer door, out of the draught; also, that the doors of rooms across the hall are not directly opposite each other, which prevents an undue directness of draught and gives better general ventilation through the hall. This ample means of airing the rooms is, however, only supplementary, the system of heating and ventilation securing a supply of 10,000 cubic feet of air per hour without the use of door or window. This is obtained by means of the "direct-indirect" system, so called, of heating. Each room has an intake for fresh air directly through the wall under the window. This intake, separate for each room, allows the fresh outside air to pass over through a steam coil boxed under the window inside, and so up into the room. On the side wall, near the baseboard, is a ventilating register which opens to a flue passing separately for each room to the attic floor, where these flues all open into a large shaft around a steam drum. The air suction is steady and sufficient to ventilate the rooms thoroughly and continuously.

The rooms are lighted by electricity and the closet by globes automatically lighted when its door is opened.

Each floor has on the east side at the end nearest the administration building a lavatory suite, which is tiled throughout with

white porcelain. There are in each suite three tubs, a shower and sitz bath, and three water-closet seats each in a separate room. A chambermaids' work-room, also tiled, and small linen closets complete the equipment on each floor.

The plumbing throughout the whole plant is open and exposed.

The stairways are in the middle of the east side and are of very easy ascent, the rise and tread being 6½ and 12 inches, respectively. The floors throughout are of hard pine filled and waterproofed, and the ceilings and walls are finished with a washable surface. All corners and angles in the building are rounded and concaved in the plastering. The dividing walls are double and made sound-proof by zigzag felting. The bed spaces in adjoining rooms are never against a common wall.

The special feature of importance, however, in the pavilions is the veranda which surrounds the building on all sides. These verandas are 9 feet wide and are intended to serve as sleeping porches at night, as well as piazzas by day. The arches which carry the roof of the building, and therefore appear structurally as if the outside wall, are very wide and cut clear to the ceiling. The arch space is 12 feet, and the intervening column is but 8 inches in diameter. Its corners are cut away as well as the outer edges of all the arches, so that the least possible obstruction is put in the way of sunlight. The columns, too, it will be noticed, are placed opposite the intervening walls between rooms, so that the whole of every window and door is directly behind the full opening of an archway. In this way no obstruction of light or air is given any room.

A canvas partition is fastened to the wall between each two rooms, and at night is drawn out to the column between the arches, dividing the veranda into porches, 12 x 9 feet, one for each room, giving privacy for the patients, whose beds are rolled from the room through the wide door on to the veranda. The canvas screens are only 8 feet high, so that there is free circulation of air above them along the veranda. Not only do these porches serve as sleeping spaces at night, but should any patient be obliged to keep his bed for a few days for any reason, the screens may be drawn out, separating his porch from the general veranda,

giving quiet and isolation and permitting him, nevertheless, to have his out-door life uninterrupted. The screens may also serve as partial wind-breaks in case of heavy wind down the veranda, though this protection is secured by the tower corners. At each corner of the pavilion the veranda is widened 2 feet into the tower, the arches here are fitted with glass doors which can be closed, giving a sheltered corner room 11 feet square, open on the two inner sides. These closed corners serve well to shut off the wind down the verandas.

Save in the most rigorous weather for a few nights in the winter, patients may thus sleep out all the year round.

The south end porches on which no rooms open give very sunny sitting places in winter, while the north ends similarly arranged give shady spaces in summer. As the patients here will not go away in the summer, it was important to provide not only for sun and shelter in winter, but for shade and coolness from the warmth of the summer mid-day. The time spent in planning this orientation was well repaid by the working results obtained.

The objection made to verandas around buildings or in front of sleeping-rooms in most essays upon sanatorium construction was not unnoticed by the Medical Board in planning these pavilions. In the intense sunlight of the unclouded sky in Colorado shade is desirable for some patients at all times and for all during the mid-day in summer. The diffusion of light being so great, directness is less constantly needed, and the porches about the pavilions have been found not to shade the rooms at all too much. The direct sunlight strikes clear across every room at some time in the day. During the winter the lowered sun pours straight into the verandas all day, while in summer it is high enough so that the porches are shady, save in the morning and evening.

The furniture of each room is simple and, so far as possible, without anything to catch dust: an enamel bed, which can be rolled through the doors on to the porch, an enamel washstand, a dresser, a small table, and a chair. The floors are bare but for a small rug at the bedside. A call-bell, communicating with the

nurses' room, and light-button are at the head of the bed, and on the veranda a drop-wire gives opportunity for light in each porch section in case of need when the patient is sleeping out. During most of the time the bed-room will really serve only as a comfortable dressing-room.

The medical building, which faces on the four points of the compass, is at an angle with the north pavilion, and thus falls back out of view in the full face of the general plan. It serves for the scientific work of the institution and for a hospital for any cases of acute illness which may arise and call for special nursing. It is 50 x 57 feet. The first floor is given to the scientific work. A reception-room, 15 x 17 feet, is entered from the hall on the left. This opens into the consultation-room, 30 x 15 feet, where the physicians have their desks, records, and library. From this room opens, along the north side of the building, a series of rooms : first, a small, quiet room for chest and physical examinations ; then a room for throat treatment, and lastly, on the northeast corner, a clinical laboratory, 18 x 15 feet. These rooms can be entered each from the hall or directly from each other. The throat-room and chest-rooms were made separate from the consultation-room to allow undisturbed examination or treatment of two patients at the same time.

The clinical laboratory has a large north window for microscopic work, sinks, and chemical hoods, and is thoroughly equipped with every appliance for scientific clinical work. In connection with the laboratory there is in the basement a large, well-ventilated room for experimental work on pigs or rabbits, and a small autopsy-room, which it is hoped may never be used.

A room arranged for *x*-ray work and a commodious dark-room for photographic work fill the eastern side of the building, and a small drug-room for medicines and supplies completes the first floor.

A stairway, made especially wide for carrying a stretcher, leads to the second floor, which is for hospital uses. A small diet kitchen, a small operating-room, sufficient for such emergency work as may arise, are on the north side. A commodious bath-room is fitted with a tub in the centre of the room for convenience

of the nurse getting at the patient. There are six rooms, 11 x 15 feet, for patients, one being arranged for isolation in case of need. On the south side, built out over the cloister, is a large sun-room for semi-convalescent patients, and the roof of the cloister beyond offers a still more open place for reclining when returning strength permits.

The power plant is 300 feet from the rear of the main building. It is 113 x 40 feet, with an L 59 x 28 for the laundry. The main building contains the boilers and steam plant, electric generating dynamos, fire pumps, and refrigerating machine. The laundry-room is equipped with modern machinery, all the laundry material being sterilized by steam before delivery to the laundry-room proper. The chimney-stack is 100 feet high.

In connection with this building is an incinerating furnace for sputum and garbage.

The drainage of the institution is carried for the present—as the city sewers do not yet extend to the site of the Sanatorium—to the east of the buildings in two sets of three series of settling cesspools, which are dug deep into the loose gravel, which drains away from the institution. The outflow is ample, as proved by tests.

APPENDIX I.

THE REPORT OF THE MEDICAL BOARD, MADE NOVEMBER 14, 1902, UPON WHICH THE PLANS WERE DRAWN.

The Medical Committee appointed by Mr. L. C. Phipps October 27, 1902, to examine the plans presented, and to make all necessary suggestions as to the requirements of a Sanatorium for tubercular patients, respectfully submit the following suggestions:

1. That the institution be considered a "Closed Sanatorium," non-sectarian, admitting both sexes.

2. That a uniform rate be charged, this rate to include board, lodging, and ordinary medical attendance, but not to include medicines, laundry, special operative work, or special nursing.

3. That the Sanatorium in no sense be considered a "Consumptives' Home" in the ordinary acceptance of the term; it should be an institution where patients with slight disease (incipient cases) can be sent with a hope of cure or of such amelioration of symptoms that they may become wage-earners again.

4. That it be, moreover, an educational institution where the patients are taught the simple but important laws of hygienic living, with special reference to their disease and the protection of others.

5. That the Sanatorium be for the open-air treatment of patients, that every part should be extremely well and independently ventilated, readily cleansible without raising dust as regards the patients' quarters, freely open to the sunshine, while sheltered from the wind.

6. That the Sanatorium be built on the "Pavilion Plan," with an annexed "Cottage System" later if deemed desirable.

7. That the first buildings be planned to accommodate not over eighty (80) patients, forty to each two-story pavilion, the upper floor of one pavilion to be devoted exclusively to women, namely, 20. The maximum capacity of dining-room and kitchen to be built for the accommodation of 125 patients.

8. The Committee would advise that the Sanatorium include the following buildings:

I. One administration building.
II. Two pavilions.
III. Medical building.
IV. Infirmary.
V. Building for laundry, lighting, and heating plants.
VI. Amusement pavilion.
VII Medical director's residence.
VIII. Stable.
IX. Cottages when required.

9. The administration building should have the following rooms:

First floor:

Two reception-rooms.
One general dining-room.
One staff dining-room.
One superintendent's office.
One clerk's office.
One library.
One serving-room.
One kitchen.
Cold storage for meats, vegetables, milk, and butter.
Small dining-room for help.

Second floor:

One matron's sitting-room.
One matron's sleeping-room.
One linen and sewing-room.
One superintendent's room.
Nurses' rooms.
Rooms for superior help.

10. Pavilions: The main front of the pavilions should face west-southwest.

Each pavilion should not be over two stories high, with covered verandas on each floor around entire building.
Each floor to have sleeping-rooms for twenty patients.
Each floor to have a bath-room containing three bath tubs and bowls, three seats, two urinals, and one sitz bath.
Each floor to have a closet for slop-hopper, with hot and cold water.
Each floor to have a linen closet, etc.
Each floor to have a closet for soiled-linen basket.
Each floor to have provision for collecting sputum cups.
Each floor to have a closet for brooms or mops.
Each pavilion to be provided with corridors not less than nine feet wide, amply lighted and ventilated.

11. Medical building.

First floor:

One reception-room for patients.
One consultation-room.
(To have double doors between reception-room and consultation-room).
One chest examination-room.
One closet for wash bowl.
One nose and throat-room.
One *x*-ray and photographic-room.
One clinical laboratory.
One drug-room.
(The two latter to have running water.)

Second floor:

House medical officers' sleeping-rooms.

One house medical officers' sitting-room.

Extra bed-rooms for visiting physicians.

One toilet-room with bath and seat.

12. Hospital building. One story:

One nurses' room.

One reception-room.

Ten sleeping-rooms, to open on covered veranda, one to be arranged for isolation-room.

One toilet-room with bath, bowl, and seat.

One diet kitchen.

One linen closet.

One closet for slop-hopper and cleaning rags.

One operating-room (small).

One mortuary in basement.

13. Amusement pavilion: To be a separate pavilion, something after the order of the pavilion at City Park. A large open pavilion capable of being closed for entertainments, if necessary, by means of a system of windows. At each end of the pavilion would suggest having a room—one for men, one for women; also to have one toilet-room for men and one for women.

14. Laundry, lighting, power, heating, and disinfecting plant all included under one roof.

This building to be as far away from main building as compatible with efficient service.

Laundry to be furnished with most approved machinery.

The disinfection plant to be in a separate room, but to communicate with laundry.

15. Power plant and stable: To be a suitable distance from buildings.

16. Every part of the Sanatorium should be so constructed as to facilitate cleaning; all corners should be rounded, and unnecessary ledges avoided. All construction to be of the simplest durable nature.

A well-lighted, dry cellar under all large buildings, and to have trunk-rooms and store-rooms.

A brick conduit from power plant to main building for heating-pipes, etc., large enough to admit the passage of a man throughout its course.

The stairs in the different buildings to be built wide, having easy rises and treads.

Each building to be provided with an electric call system in each room and on each floor.

All buildings to be wired for telephone communication with the administration building and medical building.

Full fire protection on each floor for every building.

17. All windows and doors should be so constructed as not to clatter when the wind blows or admit draughts from any possible shrinkage of woodwork after construction. Window sills to be rounded.

Each room to have one door and one large window opening on the veranda.

The door should be wide enough to roll a bed through on to the veranda.

Rooms should not be less than 12 x 14 feet.

Height of rooms on first floor not less than 10½ feet.

Height of rooms on second floor not less than 10 feet.

All woodwork to be of hard-wood well filled and varnished or painted.

Each room to have a closet, the floor of which should not be sunk below the floor of the room, and the interior to be made as carefully as that of the room itself.

No transoms over the inside doors.

No plumbing in rooms.

18. Verandas and covered balconies are an essential part of every sanatorium for consumptives, so arranged as not to darken the patients' rooms.

To properly shelter the patients, the veranda should be ten feet wide.

The veranda floors should be so constructed as to properly shed water.

Each sleeping-room to have a corresponding amount of veranda space, such space being separable by a properly adjusted canvas wall or curtain, stored in wall niche

The veranda front to have a solid wall with coping 2½ or 3 feet high.

All doors and windows to be screened.

All floors to be double floors of polished hard-wood, either varnished, waxed, or covered with a paraffin composition.

Cracks and joints should be as far as possible avoided.

Floors to be deadened.

In bath-rooms, wash-rooms, laboratory, kitchen, laundry, disinfecting-room, and corridors connecting buildings, cement, artificial stone, vitreous tiles, or "torgament" may be used, first having the space between beams filled with concrete.

19. All walls should be extra thick and deadened to prevent one patient from being disturbed by another coughing.

Walls and ceilings must be of washable surface.

20. Artificial lighting should be by electricity, as other methods add to atmospheric impurity.

All buildings should be wired for electricity and piped for gas in all rooms but the sleeping-rooms.

21. Ventilation of rooms should be as perfect as possible.

Each person should receive not less than 10,000 cubic feet of fresh air per hour while in a closed room.

The impure air removed by shafts and heated central well.

22. The Committee would recommend indirect heating, as this system seems to be the most efficacious in removing impure air and admitting fresh air.

Hot-water heating is worthy of consideration.

All general gathering-rooms to have open fireplaces.

23. Drainage: The water-carriage system with suitable cesspools.

The water-pressure must be high enough to properly flush all pipes.

If possible connect with city system.

Provision must be made for living quarters for help. Sexes to be separated.

APPENDIX II.

Board of Trustees of the Agnes Memorial Sanatorium.

C. S. Morey, *President.*
John Campion,
W. S. Cheesman,
T. S. Dines,
C. J. Hughes, Jr.
J. G. McMurtry, *Treasurer,*
J. H. Sawyer, *Secretary.*

Medical Board of the Agnes Memorial Sanatorium.

Arnold Stedman, M.D., *Chairman.*
W. H. Bergtold, M.D.
G. W. Holden, M.D.,
Superintendent and Medical Director.
Carroll E. Edson, M.D.
J. A. Wilder, M.D., *Secretary.*
L. B. Lockard, M.D.

DISCUSSION.

Dr. Fisk: I would like to say a word or two about some things that have occurred to me. In the first place, this is four and one-half miles from the city of Denver, away from the smoke of the city. It is on the plains where it has a natural exposure; it is on comparatively high ground in order to get good drainage, and it is on sandy soil—particularly sandy soil. The water supply is the city water of Denver; the mains go out to it; the exposure is nearly south, not quite south-southeast. It faces all this that Dr. Bergtold has been speaking of—facing the Rocky Mountains. As you look out you look out on mountains that are 14,000 feet high, and the range of vision is over two hundred miles. The altitude of the buildings is about a mile.

Dr. Boardman Reed inquired what are the charges for patients in this sanatorium, and whether any provision has been made for charity patients; whether charges include board and medical attention and everything necessary.

Dr. Bergtold: We might say, in comment upon Dr. Fisk's remarks, that full details concerning the situation of this institution and all the statistics regarding it are in the paper which Dr. Edson and myself have prepared, and we feel that it would be hardly right, interesting, or proper to read all those details here.

In reply to Dr. Reed, I may state that it is the intention of Mr. Phipps, who has put a great deal of time and money into this institution, to accommodate people at the lowest possible rate, and at cost, if he can do so, with the provision of an endowment so arranged that people who are not able to pay the ordinary rate can be helped and aided during their stay in the institution.

RECENT AMERICAN CONTRIBUTIONS TO THE METHODS OF PREVENTION AND TREATMENT OF PULMONARY TUBERCULOSIS.

By ARNOLD C. KLEBS, M.D.,
CHICAGO.

Although this country was slow in following the example of Europe in its organized warfare against tuberculosis, during the last few years it has made advances which of necessity will influence the methods used abroad. The danger of tuberculosis as a disease of civilized communities and its final recognition as such have brought about a co-operation against this danger uninfluenced by national boundaries. The tardiness of America in joining in the warfare against tuberculosis is probably to be explained by the natural differences which the situation here offers in comparison to that of Europe. Here are comparatively few old communities, which, as is now well recognized, are the foci of this disease; furthermore the growth of these communities and the country at large has chiefly been by immigration. The immigrants, we may presume, were on the one side the more enterprising, strong and healthy in their own country, but on the other the shiftless, physically and morally weak, and dissatisfied members of an older community, which bring nothing with them but dreams of wealth, without the power of accommodation to new conditions. Thus we have a shifting, heterogeneous population, whose true physical condition and its influence upon the population at large is extremely difficult to analyze. For this and other reasons the danger from tuberculosis, especially in its numerical expression, is apt to be underestimated. In spite of

this the greatness of the danger has been demonstrated by several American investigators. Hoffman[1] has given us a most suggestive calculation. He says: "Tuberculosis causes annually more than 150,000 deaths in the United States at the average age of thirty-five years. At this age the normal after-lifetime is about thirty-two years, so that the real loss of life covered, measured in time, is represented by 4,800,000 years per annum. If we assume that the net value of a year of human life after the age of thirty-five years is at least $50, the real loss to the nation resulting from the disease (a large proportion of which is known to be needless) may be estimated at $240,000,000 per annum. These astounding and almost incomprehensible figures are far from being an exaggeration, but let us assume that only one-half of this mortality is preventable and we have a net possible saving to the nation of $120,000,000 per annum. This estimate does not take into account the social, moral, and sentimental value of at least 100,000 lives, which, under different conditions, might reasonably hope to continue for many years. The mortality from tuberculosis is, therefore, a problem compared with which all other social problems of a medical character sink into insignificance."

The fact that various different ethnic groups, especially Negro, Mongolian, and Indian races, are living within our national boundaries was soon recognized to give to the tuberculosis problem in this country an aspect which it has only to a minor degree in European countries. The illustration of the baneful effect which intimate contact with our civilization has on these races is more striking here than anywhere else, and it is of especially great interest to us, since tuberculosis is responsible for the greatest ravages among these peoples. Various American writers have pointed out this condition, and of late Coleman, Brandt, and Hoffman have called attention to the very high death rate from tuberculosis among negroes especially. With 100 deaths from consumption among whites there were 288 deaths among the colored, which, as Hoffman says, indicates "the most extraor-

[1] Maryland Medical Journal, February, 1904.

dinary continued predisposition to death from a particular disease of which we have records in the annals of hygiene and vital statistics." A death rate of 50 per 10,000 population of cities for the colored is so enormous that undoubtedly a specially directed effort toward its reduction will soon be undertaken.

The decrease in the death rate from tuberculosis has been noted in America, as well as in other European countries, but Mays has only lately called attention to an actual increase in the mortality from this disease since 1898 for certain localities. The conditions alluded to above, which make an accurate registration of facts pertaining to the health of the population so difficult in this country, also prevent, for the present at least, a final conclusion as to whether there has been a decrease from tuberculosis or what its rate is. The great improvement which has taken place of recent years in the collection and computation of data of vital statistics will probably soon settle this important question, and will allow an estimate of the effectiveness of special efforts. The fact that the decrease in the tuberculosis death rate here or abroad is not the result of specific efforts, based upon the recognition of its infective cause, is more and more generally realized, and will probably modify and improve the methods already instituted. This has perhaps never been more strongly emphasized than in Hoffman's study of various factors which have produced a decrease in the mortality from tuberculosis, and which allows him to conclude that this decrease "must be ascribed primarily to a profound change for the better in the mode of life of the masses."

Another fact of great importance has been brought out by another investigator of this subject, Miss Brandt, the statistician of the New York Tuberculosis Committee. She shows that the rate of decrease has been distinctly greater in cities than in rural districts, and points out that active preventive measures are much needed in small towns and country districts. The same author also demonstrates for the United States a deviation from the rule established for European countries, viz., that the death rate from tuberculosis increases in direct proportion to the density of population. She shows that such a relationship can "be expected only in an old country, comparatively uniform in the composition

of its population, its industries, the development of its civic conscience, and its attitude toward sanitation."

This brings us to the recognition of the fundamental truth that it is not so much the crowding of a given acreage which favors the spread of tuberculosis, but that it is in the crowding of a much smaller area, that of one house or flat and the concomitant unsanitary conditions affecting uniformly all members of one family, where we have to look for the focus of the disease. In one word, we have recognized the tuberculosis problem as being eminently a house problem. The proof of this has been furnished in this country by Flick, Biggs, Osler, and others, and its application in preventive efforts cannot be ignored any more.

Other facts about the disease, its age incidence, its distribution among the sexes, its clinical features, the relation of its prevalence to certain occupations, etc., have all been studied in this country, showing on the whole conditions identical to those observed in Europe.

It is rather astonishing that, with few exceptions, the recognition of the fundamental truths about this disease and their application in a preventive direction did not come to us through the initiative of our boards of health, or other municipal or national agencies entrusted with the maintenance of the public health. In general, tuberculosis as a preventable disease has been sadly neglected by these bodies; hardly anything has been done by them, except an attempt at public education in regard to the communicability of the disease through the distribution of pamphlets, and by framing laws against spitting on the streets and in public conveyances. The value of both these measures are extremely problematical in the light of our present recognition of the problem as a house and family problem, and of the fact that the disease, although undoubtedly communicable, can develop to disabling proportions only when concomitant, chiefly unsanitary conditions become active, and that only by a systematic, well-directed effort against these can we hope for results. The two measures so popular with boards of health can help in this only to a very insignificant degree.

This very common apathy among health officials is fortunately not indulged in in a few of our cities and States; in very recent

times we are even fortunate to note a great activity in all questions pertaining to the municipal control of tuberculosis. The Department of Health of New York City has certainly been the most active, and its methods are perhaps the most efficient ones instituted in any community. The credit for this work belongs almost entirely to Dr. Biggs, who fortunately still is the chief medical officer of the department. Seven years were given to a preliminary study and observation of the disease in New York, which, in 1894, culminated in the adoption of resolutions involving the voluntary reporting of certain classes of cases of tuberculosis, which enabled the department to specifically direct their preventive work. In 1897 the notification was made compulsory, with the result that now only a comparatively small proportion (15 per cent.) of the cases reported dead had not previously been registered as suffering from tuberculosis. (16,614 cases reported in 1902, of which 4268 were duplicates.) This success is due chiefly to the method used; the physicians are provided with blank postal cards on which they report their cases, and with each case reported the physician has to say whether he wishes the patient visited by an inspector for the purpose of sanitary surveillance, or if he will himself conduct such surveillance on the lines suggested in the circulars issued by the department. Furthermore, all cases reported as having died of tuberculosis, and of which no previous report of the illness has been received, are investigated to ascertain why the omission was made.

With the list of registered cases as a basis, the department is enabled to direct its preventive methods, and it does it in a most thorough manner, which merits to be widely known and imitated. The inspectors of the department visit the cases, note the precautions taken in the disposal of sputum, etc., the sanitation of the dwelling, and give pertinent instruction, both verbally and by circular. They recommend certain cases for removal to a hospital or for charitable relief. Paper cuspidors are furnished free to the poor patients. Patients incapacitated for work are put under the charge of a nurse of the department, who by repeated visits ascertains whether directions are observed or not. Rooms or apartments vacated by death or removal of a consumptive are

also inspected. Infected articles, carpets, rugs, bedding, etc., if necessary, are removed and disinfected. When cleansing and renovation of the rooms are required an order to this effect is issued to the owner of the premises, and compliance is enforced, and nobody else is allowed to move in until the order is carried out. Fumigation with formaldehyde is also undertaken when recommended by the inspector. In certain cases where a consumptive repeatedly disobeys the instructions, especially about the proper disposal of the sputum, the department can order the forcible removal of such a case. At a few hours' notice such cases can be sent to the department's special pavilions for advanced cases at Riverside Hospital. A dispensary for ambulant tuberculous patients, adjoining the building occupied by the Department of Health, has been recently opened, adding another important agency to the department's extraordinary resources in their fight against tuberculosis.

The institution of a special Tuberculosis Committee by the State of Maryland, an example which is being followed by other States, is probably going to bring about further advances in the study and municipal control of the disease. Several States and cities have built or are planning to build sanatoria for the care of their tuberculous poor, but before I speak of these more curative efforts I wish to record the work which has been done by private enterprise in a preventive direction. Already in 1892 the Pennsylvania Society for the Prevention of Tuberculosis was founded and organized by Dr. Flick. It has become the prototype for a number of similar associations of medical and lay members in this country. Almost all the larger cities have in the last two years formed similar societies which are engaged in active work. This certainly is expressive of the great and general appreciation of the danger of tuberculosis to society in general. The efforts of these associations cannot and are not meant to supplant official efforts; on the contrary, in a problem of such magnitude, they form a most needed assistance to them, especially in an educational direction. Most of the antituberculosis associations collect information about the social aspects of tuberculosis, and by lectures, pamphlets, mass meetings, and

press articles influence and educate public opinion, direct relief work being undertaken by a few only. A great deal of work has been already accomplished in the short space of time, and much better understanding of the facts relative to tuberculosis has been effected. It would be impossible here to enumerate the work of all the various societies, valuable as it certainly is. Still the work of a few of these societies must be recorded, since they possess unique features, independent to a large extent of foreign examples. The Committee on the Prevention of Tuberculosis of the Charity Organization Society of New York has made its contribution to the cause by issuing a handbook on the prevention of the disease. In this book we find the record of the work this committee has done in public propaganda and direct relief of the poor consumptive, and also some excellent essays on the various phases of the problem. The investigation made by the statistician of the committee, Miss Lilian Brandt, appears here, and has already been alluded to. Drs. Biggs, Jacobi, Knopf, Prudden, and others need only be mentioned as contributors to show the high standard of this book. Probably in no other city has the close co-operation of a private association with the various municipal departments been brought to such a high degree of effectiveness as in New York, and it would be well if other cities would follow this example.

The Boston Association for the Control and Relief of Tuberculosis has inaugurated, thanks to Dr. E. O. Otis' efforts, as a special feature of its endeavors, a free dispensary; it also cooperates closely with municipal and charitable agencies, giving instructions and relief to needy consumptives.

The Chicago Tuberculosis Committee, working under the auspices of the Visiting Nurse Association and the Bureau of Charities, carries on its work somewhat differently from the other associations. It has several district offices in the various crowded parts of the city in charge of physicians, who have volunteered for the service, and who, with the help of the visiting nurses, take charge of the consumptives and their families in their homes. Relief where needed is given upon specific recommendations by these physicians, by the Bureau of Charities, or other

agencies. The committee has also carried on a very extensive propaganda for improvement of housing conditions and domestic hygiene. Its policy is to carry its teachings and assistance into the families affected and primarily save other members of that same family. Extensive investigations as to the conditions under which consumptives live in their homes are being undertaken, and a report on it will be made soon.

One association stands out pre-eminently as being founded through the munificence of one man, and working with means equalled by no other one. It is the Phipps Institute for the Study, Prevention, and Treatment of Tuberculosis in Philadelphia. It combines in one enterprise all the various prophylactic measures carried out by the other societies, and in its ultimate development is destined to exert a most valuable influence on others. In general, it follows most closely the method of work inaugurated by the dispensaries in France, the best example of which is the Dispensaire Emile Roux, in Lille. Quite recently the Bellevue Hospital and also the Vanderbilt Clinic of New York have given special attention to the dispensary supervision and treatment of tuberculous cases. The resources of Bellevue Hospital seem to be very ample, and much useful work is to be expected.

The greatest impetus which the tuberculosis crusade has received in this country is undoubtedly to be found in the holding this year of the Tuberculosis Exposition in Baltimore, which was exactly what its promoters wanted it to be—an objective presentation of the history, distribution, varieties, causes, cast, prevention, and cure of tuberculosis. Everyone interested and working for this cause was represented in the exhibits, which attracted great crowds of visitors. Men like Osler, Welch, Fulton, Thayer, Jacobs, and others had worked hard to make it perfect, and with such assistance it could not well be otherwise. One of the results of the exposition, which probably will be of national importance in the crusade, was the first conference called together to consider the foundation of a national association, which now has been materialized in the birth of the National Association for the Study and Prevention of Tuberculosis, which will hold its first meeting next week.

Characteristic of modern tendencies was the exhibition of various appliances and plans for institutions for the out-door treatment of the disease. The humblest tent or shack was represented as well as the plans for most palatial sanatoria. Eminently American are the appliances for out-door sleeping. This phase of the treatment seems to me to have been originated and developed in this country. It must be considered a most important addition to the other features of the sanatorium *régime*. Out-door sleeping was probably first systematically practised in the dry atmosphere of our western plains and mountains. But it was soon found to be also of obvious advantage in eastern climates with appropriate appliances. Since the inauguration of the open-air "Liegekur" in Falkenstein by Dettweiler, the realization of the fact that the permanent open-air life is of the greatest importance in phthisiotherapeutics. We have, furthermore, learned to recognize the fact that it is the open-air element, as such, which exerts the most beneficial effects; that sunshine, equable temperature, absence of winds, uniform and, if possible, a low degree of humidity are desirable elements in most cases, without being necessary in such degrees as only certain climates can furnish them. The out-door sleeping for the tuberculous, then, became a logical consequence of this realization, and in my opinion it is one of the most important contributions which was ever made in phthisiotherapeutics. In our eastern climates we need protection principally against rain and snow and high winds. Many of the appliances shown at Baltimore fulfil these requirements—the Fischer tent, the Millet shack, and the various sleeping-bags (Knopf's, for example). The tents, to judge from the exhibits, seem to be in the highest favor; their chief advantage, it seems to me, lies in their cheapness and transportability; other advantages I cannot see, but many disadvantages, chief among which is the difficulty to ventilate and light them. This is best illustrated in the elaborate appliances for ventilation in the Fischer and also in the Gardiner tent. The large tents used on Blackwell's Island show this defect to a still greater extent. By using solid wooden walls, and by leaving out the fourth wall entirely, we get the best ventilated sleeping space, and at not much higher

cost. This type is best illustrated by the shacks which have proved of great advantage, the principle of which has been utilized for some time by the Saranac school. I know of no better plan for such a shack than that devised by Dr. King, of Liberty, who has made use of it during the last very severe winter. Its simplicity and comfort must appeal to everyone who takes the trouble to examine it, and its principle can be applied for one as well as for twenty patients. Briefly stated, it consists of a sleeping space well sheltered against prevailing winds, but open on one side entirely (canvas curtains are supplied for emergencies); with a small adjoining room for dressing, bathing, and toilet facilities. One shack which Dr. King has built at Liberty, and which has proved eminently satisfactory, costs for eight patients not more than $580. The patients living in this shack take their meals in the main building, but there is no reason why a kitchen and living-room could not easily be added to it at comparatively slight extra expense, making such a shack a small independent sanatorium. Of course, such a structure would be suitable only for the incipient cases, who are able to be up and around. Since we have recognized that good permanent therapeutic results are obtainable only in such cases, the value of such a structure, constructed and managed cheaply, becomes of paramount importance. There is no doubt in my mind that such small sanatoria constructed near parks in larger cities, or on the outskirts of smaller ones, would be of unmeasurable benefit to many patients, who now are waiting until their disease is sufficiently advanced to make desirable a transportation to a better climate, which, unfortunately for these poor creatures, is still too often considered the only salvation. It has taken a long time until the pioneer work in the building of sanatoria, that of Trudeau and Bowditch, has found imitators.

In the construction of larger sanatoria there has been in the last year a great activity in this country. Several States are following the example of Massachusetts, whose sanatorium at Rutland has become the type widely imitated, both as to construction and management. New York, Rhode Island, and Connecticut are building, and many other States, notably Minnesota, Ohio,

and others are planning sanatoria. Several municipalities are also active in this direction. Interesting and suggestive is the effect which the sanatorium movement has exerted on the architecture of homes, as exemplified in some houses at Saranac with open-air bed-rooms. There are two points whose importance has now become of paramount interest in the management of the sanatorium, if it shall do the most good to the class of patients accepted, viz., incipient cases only: first, the occupation of the patients during their stay at the institution; second, the management of the cases after dismissal. These points have by no means been worked out, and it will still need considerable time before a satisfactory solution is found.

Reviewing the tremendous amount of work which has been done during a short space of time in this country in the subject under consideration, we can confidently hope for many and valuable contributions in the near future to this cause, which now has become of international importance.

I must not omit to mention that a very great share in these achievements belong to the activity of the American Climatological Association. The Transactions of this Society contain probably the most valuable contributions to this subject made by any medical body in this country, and it is significant that the most important movements working toward the restriction and cure of this disease have been started, or at least been decidedly influenced, by members of the Association.

DISCUSSION.

Dr. Otis: Dr. Klebs has indeed presented a very hopeful outlook of what is being accomplished in this country in the prevention of tuberculosis, and especially of what is being done under his initiative in Chicago. I wish only to add some facts regarding our work during the last year in Massachusetts and Boston. Last year the State Legislature appropriated $150,000 for the enlargement of the Rutland Sanatorium. This addition is now in process of construction, in the form of several detached buildings, and when they are completed the institution will accommodate 400 patients. In the Legislature

of the past winter a bill for the appropriation of $150,000 for the purpose of erecting a hospital for advanced cases of consumption, to be situated within ten miles of Boston, was introduced and favorably considered, but finally failed of passing.

One or two years ago the city of Boston passed a bill appropriating $150,000 for a municipal consumptive hospital, designed especially for advanced cases. This appropriation still stands, but the Mayor withholds his approval for the alleged reason that the sum is inadequate for the purpose.

The Boston Association for the Relief and Control of Tuberculosis has been actively at work the past winter—its first winter's work. Its efforts have been directed principally in two directions: First, in the investigation of the consumptives at their places of abode, and providing for their wants, as far as possible, in the matter of proper food, sputum receptacles, etc. A paid visitor is employed, and the nurses of the Instructive District Nurses' Association also visit cases referred to them from the Boston Dispensary and other out-patient departments. A written report is made by the nurse to the physician referring the case, which becomes a part of the record of the case. Arrangements are also made, when possible, for sending consumptives to Rutland and elsewhere. The Board of Health also has authority to remove consumptive patients from their domicile when, in their opinion, the conditions require it.

Secondly, an educational propaganda has been carried on by means of lectures and leaflets. Something like seventy lectures have been given before all sorts of audiences by many physicians. An especial point has been made of lectures and the distribution of leaflets in the public schools. The masters of the schools have manifested much enthusiasm in this work, and have repeatedly asked for lectures. Very frequently these lectures have been illustrated with stereopticon. Finally, the Association is agitating the subject of a municipal hospital for the advanced cases, and it is hoped in the near future to accomplish this. The accommodations for such cases in Boston, as in most other cities, are very inadequate; and hence the Board of Health is much embarrassed in removing dangerous cases for want of proper accommodations. The Association employs a paid general secretary.

Dr. Babcock: In expressing my appreciation of Dr. Klebs' paper I must enter a protest against his very modest report given of the work done by the Association for the Prevention of Tuberculosis in Chicago. This Association owes its inception and its success solely to Dr. Klebs. Were it not for Dr. Klebs' efforts in the city of Chicago there would be practically nothing done to-day along this line, and I feel that it is nothing more than just that the modesty of this man should be recognized and his efforts in that direction in Chicago duly appreciated.

Dr. B. F. Lyle: Ohio is not behind in the effort to stamp out tuberculosis. Our last Legislature gave us a certain amount of money for the purchase of ground for the establishment of a State sanatorium. Cincinnati claims the honor of being the first municipality to establish a hospital for the care of tuberculous patients. Our hospital was established in July, 1897, and we have at the present time a daily attendance of one hundred patients in the institution. It is intended for the care of persons unable to defray the expenses of a private sanatorium, and we admit patients with the illness in every degree of severity. During the past winter we have kept quite a number of patients in tents; we have found they improved very much more than those who were in the buildings, and we feel that through the inauguration of this method in our climate we have done a great deal for the benefit of the patients as well as to establish the recognition of the value of this method of procedure in public estimation.

Dr. Minor: In speaking of Dr. King's tent (and I was glad to hear Dr. Klebs speak of it so highly) there is one special advantage I find in his shack that has pleased me a great deal, and that is the attachment behind of a heated bath and dressing-room. In the winter time, when patients live in shacks, as a number of mine do, it is either necessary to give up the morning cold ablution or to have such an addition—that is, an arrangement by which, although the shack itself is wide open, there is a small closed room, heated by a stove, into which the patients can go and take their morning baths and dress. I also am glad that Dr. Klebs insisted on that important point of the general inutility of such tents as are generally used, and the infinite superiority of the shack.

Dr. Klebs: I have not much to say in closing, except that I want to apologize that I had to leave the discussion of a great many valuable contributions. I wish to call Dr. Quimby's attention to the fact that I was not talking of "modern" methods—that my paper was on "recent" American—some recent American contributions which struck me as being particularly American and particularly destined to influence our methods of treatment and prevention. It did not matter at all if they were done before by single individuals; the general adoption of those methods seemed to me to constitute contributions of the very greatest importance which were made by Americans.

HUMAN SLAVERY AS A PREVENTION OF PULMONARY CONSUMPTION.

By THOMAS J. MAYS, M.D.,
PHILADELPHIA.

In the arduous research for new measures to stamp out pulmonary consumption it is astonishing to find that one of the most interesting episodes in the history of our country, which clearly points out the true and only rational path for the extermination of this disease, is entirely overlooked, viz., that pulmonary consumption was comparatively unknown among the plantation slaves of the South before the war, while in the large cities of the South during that period it was no more prevalent among them than it was among the whites. This rarity was so obvious and is verified by so many lay and medical authorities that it does not call for any extended statistical support. Thus, according to the health statistics of Charleston, S. C., of which I was not able to obtain an uninterrupted report up to the present time, the negro death rate of consumption in that city in 1860 was the same as among the whites, viz., 1.75 per thousand living. In 1867, whites 2.00, negroes 3.40; in 1876, whites 2.00, negroes 6.95; in 1881, whites 2.60, negroes 7.03; in 1890, whites 3.55, negroes 6.86; in 1900, whites 1.23, negroes 6.15; in 1901, whites 1.89, negroes 5.04; in 1902, whites 1.43, negroes 5.74. This shows that the disease was 228 per cent. more prevalent among the negroes in 1902 than it was in 1860, and that its death rate was 300 per cent. greater among the negroes than among the whites in 1902. A similar vulnerability of the negro race to consumption is shown in other sections of the South.

Thus in New Orleans its annual average death rate from 1897 to 1901—a period of five years—is 123 per cent. greater among the negroes than among the whites; in Atlanta, Georgia, from 1899 to 1901—a period of three years—it is 141 per cent. greater, and in Augusta, Georgia, from 1898 to 1902—a period of four years—it is 424 per cent. greater among the negroes than among the whites.

Now, on what score can we account for the enormous increase of consumption among the former slaves of the South since 1860? Why should the death rate from consumption be from 200 per cent. to 400 per cent. larger among the negroes than among the whites of the South at the present time, and this in spite of the fact that they were on an even basis in this respect in 1860? What destructive change has occurred in the environment of the Southern negroes since 1860 that has left the white race practically untouched? Why should the negroes in the course of thirty-five years be transformed from the least to the most consumptive race in this country? This came to them neither through a change of climate nor through the influence of migration, but in the land of their unwilling adoption in which they had continually lived for more than two hundred years, and without a single visible sign of warning. It is this: Since they obtained their freedom their entire social, economic, and political being has been revolutionized. In place of being dependent on their owners for their food, clothing, shelter, medical care, and nursing, as they were in the days of slavery, they are thrown on their own resources and are forced into a struggle for existence that is as unequal as it is tragic. They are thus brought into the most intense competition for existence with a people whose civilization is thousands of years ahead of their own development.

Their condition may be fitly compared to that of an animal which is confronted by a new geological epoch to which it must adjust itself or perish. It is not surprising, therefore, that in this task of readjustment many of them fall a prey to diseases of the brain and nervous system—the very organs which bear the brunt of the battle in adapting this race to its changed environ-

ment, and for this and no other reason do they become consumptive.

That the brain and nervous system endure the strain of this great contest is amply attested by the fact that before the Civil War insanity, like consumption, was comparatively rare among the negro slaves.

According to Dr. T. O. Powell,[1] this disease has increased 705 per cent. among these people from 1870 to 1890 in the State of Georgia. This high authority also states: "I am forced to believe that insanity and tuberculosis are first cousins, or at least closely allied. The sudden outburst of insanity with the colored race of the South came associated with tuberculosis, hand-in-hand, keeping pace one with the other."

The same is true of North Carolina, for Dr. J. F. Miller, Superintendent of the Eastern Insane Hospital of that State, declares[2] that from 1885 to 1896 insanity increased 256 per cent. among the colored people in that State, and that in 1884 consumption caused 14 per cent., and in 1895, 27 per cent. of the total number of deaths in his hospital, and this in spite of a reduction of the general mortality rate.

Dr. James D. Moncure,[3] Superintendent of the Eastern Hospital for the Insane in Virginia, states that whereas before emancipation there were about 60 insane negroes in that hospital, now (1896) there are over 1000, an increase of over 1600 per cent., and that they readily contract consumption.

It is obvious, therefore, that the tremendous increase of consumption and insanity among the Southern negroes is, in the first place, due to the heavy economic and industrial burdens which were suddenly placed on their shoulders, and which they had neither the wisdom nor the organized constitutional or mental strength to discharge; and in the second place, to improvidence of living, to poor and improperly prepared food, to ignorance of the laws of physiology, to bad hygienic surroundings, to over-

[1] Dr. T. O. Powell, Superintendent of the Georgia Asylum for the Insane, Report on the Increase of Insanity and its Supposed Causes.

[2] The Effects of Emancipation upon the Mental and Physical Health of the Negro of the South, North Carolina Medical Journal, November 20, 1896.

[3] Private communication.

crowding, laziness, and the lack of persistent employment, to improper care and nursing when ill, to dissipation of all sorts, to lack of self-restraint, to alcoholism, and other vices. On this point the testimony of Dr. Miller, who has been quoted, is very emphatic and applicable. He says : " The negro in slavery had no thought for the morrow, but he spent his quiet, humble life in his little cabin, with his master to care for every want of self and family. He lived under the best hygienic restraint. His habits of life were regular, food and clothing substantial and sufficient, and the edict of his master kept him in-doors at night and restrained him from promiscuous indulgence and the baneful influence of the liquor saloon. In sickness he was promptly and properly cared for by physician and nurse. Freedom came to him, and a change came over his entire life. Under his former manner of living he enjoyed wonderful immunity from brain and lung trouble ; and I confidently assert that the germs of these troubles came to the same man and race in consequence of his changed environment and the manner of life which followed."

That the same influence which gave immunity to the Southern slaves from consumption will produce the same effects elsewhere is shown on a somewhat less extensive scale by the event of the importation of Chinese labor into Cuba.[1] Thus from 1860 to 1870 Spain brought 250,000 coolies under contract to the island of Cuba. Their ages ranged from eighteen to thirty years, and they consisted of the scum and off-scourings, principally of the cities of Canton and Macao, and, in spite of the most careful selection, they brought with them consumption and other diseases and vices for which China is noted. The vast majority of them were placed on plantations, and being under contract and under the supervision of overseers who ministered to all their physical necessities, their conditions were identical to those which surrounded the negro slave in the South before the war. The result was that within the first few years consumption was eliminated, either through death or cure, and never reappeared in them or in their offspring.

[1] Dr. H. McHaton, Georgia Journal of Medicine and Surgery, June, 1902, p. 258.

From all that has been said, the prevention of pulmonary consumption resolves itself into such efforts of education as will impress the masses with the importance of leading a life similar to that (excepting slavery) which made the slave population of the South practically immune from this disease before the Civil War.

What was done once may be done again, for the laws of health which held true then are equally applicable now. Such efforts of prevention mean the inculcation of sound principles of hygiene; the eating of wholesome and properly prepared food; the wearing of suitable and seasonable clothing; the avoidance of damp, unsanitary, and overcrowded dwellings; the abstinence from nerve strain and overwork; the shunning of strong drink and other vices; the teaching of the value of useful labor; the encouragement of agricultural and mechanical pursuits; the training in physical development; the supervision of proper convalescence from what to them seems a trivial cold or cough, or from acute illness or injury; the procurement of effective medical attendance, and nursing in sickness or accident, etc.

Now a large hospital and dispensary practice among consumptives, extending over a period of eighteen years, has convinced me that the practical solution of the prevention of this disease is one of reaching the masses. People who are predisposed to or are suffering from this disease do not come to such institutions until the malady has gained a strong foothold and the stage of prevention has been passed; not because they would not eagerly do so, for they possess as strong a share of the instinct of self-preservation as the common run of mankind, but they fail to realize the true significance of their condition until it is too late. Hence the only effective measure is to bring yourself in contact with the people by inaugurating a campaign of education. To bring this about is for a charitable organization to divide a city or some of its wards into convenient sized sections, allot each section to a competent physician, whose duty it will be to make a general canvass of his section once a month, or as often as is necessary, among all willing residents who show or possess a family taint, or who for any reasons are believed to be in danger of consumption, to take con-

densed histories of all such individuals and families, to impart advice in regard to food, clothing, shelter, habits, etc., to give medical counsel and treatment whenever needed, and to send all cases which need active supervision to an institution which is well supplied with all the paraphernalia necessary for the treatment of every defect in such individuals.

THE PITCH OF THE NORMAL PULMONARY VALVE SOUND AND THE PRACTICAL SIGNIFICANCE OF ITS CHANGES IN ACUTE LOBAR PNEUMONIA AND IN EMPHYSEMA OF THE LUNGS.

By HOWARD S. ANDERS, M.D.,
PHILADELPHIA.

As indicated by the title of this paper, there are three points to be considered, based essentially upon one physical attribute of sound: the first pertaining to the normal pulmonic sound, as to pitch; the others, pathological. The former is fundamentally related to the other two; the latter can have no practical or dependable significance or value without an inductively established basis in the former. Indeed, the concrete, logical importance of this proposition is analogous to that of the minor premise of a syllogism.

Unless the pitch of the normal pulmonic second sound can be shown to be a physical sign so invariable in the average healthy adult of early and middle life that a probable or positive judgment can be formed whenever that normal is affected by diseased thoracic conditions, its reliability as a criterion in prognosis and treatment, as well as in diagnosis, must be disregarded. In studying this sign, therefore, the purpose is to give it a proper emphasis, not, of course, as an independent, pathognomonic factor, a *sine qua non*, but in connection with the general objective status and progress of the given case.

1. The Normal Pitch. In the consideration of the physiological and pathological variations of the second sound at the pulmonary valve region, as well as at the aortic, accentuation or

intensification and the opposite are more or less fully referred to by writers and clinicians; but the element of pitch is virtually and implicitly untouched. That this is so because of an apparent acceptance of the diagnostic sufficiency of changes in the loudness of the sound, rather than because of any physical or psychical inability to distinguish or discriminate on the part of the auscultator, seems to me quite probable. Nevertheless, it appears quite singular that the characteristics of pitch changes should have been unrecognized when one realizes that in the practice of percussion alterations of the quality of sounds are determined much more often and precisely by noting the changes of pitch than of intensity, of elevation or lowering of tone more than of exaggerated loudness or softness.

Obviously, the pitch of the normal pulmonic sound must be a relative term, based upon a comparison with that of the aortic sound, as the respective valves of production are morphologically and functionally homologous.

My deductions are founded upon a careful, comparative auscultation of the pulmonic and aortic second sounds in 470 healthy individuals, unselected as to age, sex, or occupation. The majority were not younger than twenty-three years of age, nor older than forty-four years, although the range was from eighteen to fifty-five years. Approximately, 2 per cent. were women.

In 77 per cent. of the persons examined the pulmonic second sound was distinctly and absolutely *lower in pitch* than the aortic sound; in about 10 per cent. additional no perceptible difference in the pitch could be detected. In the remainder (13 per cent.) the pitch of the pulmonary valve sound was a perceptible trifle higher than that of the aortic. Of the latter, however, it should be noted that while the individuals were seemingly and presumably healthy, without any evidence of thoracic or interrelated organic disorder elsewhere whatsoever, about 5 per cent. manifested sufficient physiological, temperamental, or psychical exaggeration of cardiac action to justify their elimination from this class, strictly. Thus the effects of temporary excitement or nervousness attending the examination, whether emotional or subconscious, and of physical exertion just previous to examination, were frequently

observed in connection with some increased rapidity and force —a sort of physiological irritability—of the heart action, and simultaneous elevation of pitch of the second sound, with relatively higher pitch of the pulmonic sound.

Broadly stating it, therefore, in about 80 out of every 100 normal adults the pitch of the pulmonary valve sound is slightly and yet so much lower than that of the aortic second sound, that a degree of elevation of the former corresponding to that of the latter, and perforce, exceeding it, should be considered sufficient grounds for surmising an abnormal condition of the heart or lung, acute or chronic, however incipient or latent, mild or obscure.

Right here, to avoid the possibility of any misunderstanding, we need to differentiate clearly between pitch and loudness as affecting the pulmonic second sound, for example, elevation of pitch and accentuation, or intensification are not synonymous. Strengthening or weakening of the sound are commonly referred to in indicating its physiological or pathological variations. Whether it be true or not, as Cabot (*Physical Diagnosis*, Preface) rather sweepingly asserts, that, to repeat that the aortic second sound is normally louder than the pulmonic sound is one of the "well-worn myths," the fact here insisted upon is, that as regards the *relative pitch* of the two sounds in the average individual, that of the aortic is surely higher than that of the pulmonary valve.

Generally speaking, anything which stimulates an hypertrophy of the right ventricle, by increasing the resistance to the flow of blood through the lungs, causes an accentuation of the sound of the controlling valve of the pulmonary circulation. According to the degree of back pressure and of the compensatory right ventricular response will be also the height of the pulmonic sound pitch. Nor does this statement involve a contradiction of the well-known physical law of acoustics, namely, the louder the sound the lower the pitch, other conditions being equal; for, in most instances, the intravascular pressure is so greatly increased that pitch is more influenced than is intensity of sound, in obedience to a supervening law that the greater the tension the higher is the pitch. In other words, it is a question of conditions predomi-

nating in which the law concerning pitch operates over that concerning intensity—a partial eclipse of the latter, as it were—although both are affected by exaggerating factors. Again, the conditions are not actually the same, at any rate, as the normal cardiac pressure and vascular tension of the left ventricle and the systemic circulation are relatively more marked than on the right side; so that, as regards the relation of loudness and pitch, each side is governed by the law given, according to the changes happening, but not necessarily or always as compared with altered conditions on the opposite side of the heart.

In my experience, accentuation or increase in intensity of the pulmonic second sound is more noticeable where the evidences of hypertrophy of the right ventricular myocardium are prominent—where the *vis a tergo* is specially marked; while extreme elevation of pitch accompanies those affections associated with excessive obstruction to the flow through the pulmonary capillaries—where the *vis a fronte* predominates.

2. The Pulmonic Sound in Acute Lobar Pneumonia. It is hardly necessary to reiterate, and certainly not to elaborate upon the fact and rationale of the great stress and strain under which the right ventricle labors, and, aided or unaided, must exert itself against in this very dangerous and mortal disease, if the patient is to recover. If to this we add the triple handicap of a muscular wall and strength less powerful naturally than the left ventricle, and the depressing and disintegrating influences of the toxæmia and of the fever, directly or indirectly, we have an enormity of inexorable conditions to face and combat that might be likened to the appalling consequences one should expect to befall a person of deficient and weak muscular development, no physical training, and partially drunk, who should attempt to run a 550-yards dash. Is it not of the first importance, then, that any diagnostic danger signal or warning should be understood and promptly heeded by the engineer—the attending physician?

One thing I am constrained to urge in this connection, and that is the vital and momentous significance of changes in the pitch of the pulmonic sound. The primary effect of the consolidated lung upon the pitch of this sound being to elevate it to a

degree above that of the aortic sound corresponding to the amount of increased tension in the pulmonary circulation, we know that so long as the heightened pitch is maintained the right ventricle is meeting the compensatory requirements of the case for a favorable outcome. Of course, the critical point is to detect as immediately as possible any and the first evidence of weakening of the right ventricular force, for prognostic and therapeutic reasons.

In my judgment there is no more prompt and positive sign of the impending danger than a slight lowering of the vicariously accentuated pitch of the pulmonary valve sound. And I repeat, that such a change in pitch to the trained ear may be recognized earlier, since it occurs earlier, than any diminution in the intensity or loudness of the sound.

If, as is not infrequently an associated feature in severe cases with extreme intraventricular and intravascular pressure and tension, reduplication of the second heart sound is heard because of the quicker closure of the pulmonary valve cusps, the depression of the previously and favorably elevated pitch is accompanied by a restoration of synchronism. The more rapid and decided the lowering of the pitch of the pulmonic sound, the more imminent the danger of sure and speedy dissolution.

The relation which the normal pitch of the pulmonic sound, as here considered, bears to an accurate and timely estimation of the course taken by a case of pneumonia is evident enough, doubtless. An accentuated sound (as to pitch) lowered to a degree consonant with the aortic sound is manifestly not as immediately dangerous as when it reaches the still lower pitch of normal degree. It is the spiteful, high-pitched snap of stubborn resistance that one wishes to hear until the crisis is over. The partial yielding of an aortic pitch of resentment makes one anxious, but still hopeful; the soft, flabby, unconditional surrender to a pitch that in health would be normal is now fatal—at once a flag of distress, and a flag of truce with death.

Conversely, an elevation of pitch at the outset or throughout most of the fastigium of the disease that does not rise perceptibly above that of the adjacent aortic sound augurs unfavorably for right ventricular capacity, unless the case be a mild one.

3. The Pulmonic Sound in Vesicular Emphysema. In this affection, a type of the chronic pulmonary disorder, we have a nice illustration of the fact that the condition of the right ventricle is determined by the attribute of pitch and not by accentuation of mere loudness, as the heart sounds generally are weakened on account of the damping, buffer, non-conducting effect of the enlarged and border-extended lungs.

Myriads of pulmonary capillaries diminished in calibre because overstretched by the permanently distended vesicular walls, and at the same time more or less affected with fibrosis, perhaps, mean on the whole a large area of increased resistance to the onflow of blood, and consequent strain upon the right ventricle, and increased tension upon the pulmonary valve leaflets.

As in the case of pneumonia, analogous and relative changes of pitch serve as indicators of the cardiac condition, of the approach of forming complications, as the various passive congestions, etc., in a most satisfactory way.

Finally, in the recurrent attacks of bronchitis, or "winter cough" of old people, and of paroxysms of asthma, the physical diagnostician recognizes in persistent and progressive elevations of pitch, especially during the intervals of suffering, the incipient development of emphysema, with its augmenting reaction upon the tension of the right-sided cardiovascular apparatus.

METEOROLOGIC CONDITIONS IN THE CAUSATION OF LOBAR PNEUMONIA.

By J. M. ANDERS, M.D., LL.D.,
PHILADELPHIA.

In considering the question of the relation of meteorologic phenomena to a microbe affection such as lobar pneumonia, I shall attempt to divorce their effects upon the growth, development, and propagation of the specific micro-organisms of the disease, and its conveyance from the sick to the healthy, from their influence in determining predisposition or individual susceptibility.

The present state of our knowledge concerning the influence of the agencies that bring about predisposition to lobar pneumonia is far from satisfactory. Respecting the etiological importance of meteorologic conditions in this disease, a few fundamental truths may be regarded as being definitely settled. Although certain assumptions previously laid down may be admitted, the general truth remains that there is a marked conflict of opinion as regards vitally important aspects of the subject, as the divergent views and summarized results of the observations of authors presented below will clearly indicate.

It is to be remarked that temperate zones include areas which are quite diverse climatically. Obvious differences in meteorologic elements are determined also by proximity to the coast, by altitude above the sea level, and other considerations. Hence the climatic data of no single locality convey a clear idea of the meteorologic conditions of large divisions of country defined by selected isotherms. Again, in order to determine the exact values of the different meteorologic elements, observations extending over a large number of years are necessary, on account of the

variability in the means in corresponding months of successive years. It is therefore here proposed to consider the data bearing upon the climatic factors as recorded at the United States Weather Bureau for a period of twenty years;[1] and in the first instance to note the effect of the seasons upon the incidence of lobar pneumonia for a period of ten years, or for the interval of time during which the death rate from this affection has been recorded in Philadelphia.

Jurgensen[2] and other writers hold that "disposition for pneumonia is entirely different from that for catarrh of the respiratory tract."

Grimshaw[3] has set forth the weekly average number of deaths in London and Dublin from pneumonia and bronchitis, respectively, in the ten years, 1876–85, as well as the actual weekly number of deaths from those diseases in the year 1886. From these statistical results it appears that the fatality and prevalence of lobar pneumonia do not correspond with the seasonal prevalence and fatality of bronchitis, the latter increasing less quickly in winter and remaining more prevalent and fatal in spring and summer than bronchitis, and *vice versa*.

It has been incontestably shown by collective investigations in different parts of the world that the disease is, in a measure, due to seasonal influences, and that the greatest incidence is observed in the winter and spring months. Seitz's[4] large Munich statistics showed that 36.8 per cent. occur in the spring, 32 per cent. in the winter, 15.7 per cent. in the autumn, and 15.3 per cent. in the summer. In London, according to Herringham's statistical account, the period of highest incidence is from the end of March to the end of June.

Hirsch[5] gives an elaborate table of percentages of pneumonic

[1] My grateful acknowledgments are here due and cheerfully made to Mr. T. F. Townsend, for kind aid in furnishing these records, and also to Dr. R. H. Spangler for kind aid in preparing the tables and diagrams.

[2] The Etiology of Croupous Pneumonia, Ziemssen, 12 Liefering, S. 16.

[3] Pythogenic Pneumonia, Dublin Journal of Medical Sciences, May, 1895.

[4] Croupous Pneumonia and the Meteorologic Conditions in Munich in the last twenty years. Beiercher Intellingsblatt, 1874.

[5] Handbook of Geographical and Historical Pathology, vol. iii.; translated from the second German edition by Creighton. London, The New Sydenham Society, 1886.

prevalence in the various months at a large number of localities in Europe and America. He found that the greatest number of cases fall in the months from February to May. The average for all places mentioned in the table gave 34.7° C. in spring (March to May inclusive); 29° in winter (December to February); 18.3° in autumn (September to November), and 18.0° in summer (June to August).

Riebe[1] has tabulated the cases occurring in the Garrison at Posen for each month during the years from January, 1873, to October, 1881, inclusive (see table):

TABLE I.

Months.	1873	1874	1875	1876	1877	1878	1879	1880	1881	Summary.
January	4	14	8	8	2	10	7	1	19	73
February	...	18	14	9	4	4	15	10	12	86
March	1	13	12	32	9	4	23	7	24	125
April	6	11	15	14	3	3	20	5	14	91
May	16	6	3	10	4	8	7	1	22	77
June	8	9	8	5	2	2	6	2	6	48
July	5	6	3	...	1	4	4	3	4	30
August	1	9	4	3	...	5	...	...	4	26
September	...	5	...	1	1	7	2	2	1	19
October	...	3	4	...	1	1	1	...	...	10
November	...	1	8	4	1	2	1	3	...	20
December	5	8	19	2	3	5	7	2	...	51
Summary	46	103	98	88	31	55	93	36	106	656

Kohnhorn[2] obtained similar results at the garrison in Wessel.

E. Aufrecht[3] in 1501 cases of pneumonia found the seasonal distribution as follows: first quarter, 544 cases, or 36.2 per cent.; second quarter, 462 cases, or 30.7 per cent.; third quarter, 182 cases, or 12.1 per cent.; and fourth quarter, 313 cases, or 20.8 per cent. Musser[4] states that of 195 cases under the care of his colleagues and himself at the Presbyterian Hospital, Philadelphia, 169 occurred in the first quarter, 57 in the second quarter, 31 of which were in April, 18 in the third quarter, and 51 in the fourth quarter. Seibert's[5] statistics collected in New

[1] Viertel Jahrsschrift f. Gerichtliche Medicin, u. f. 40–41, p. 129.
[2] Militararztliche Zeitschr., 1882, Heft 1 und 2.
[3] Nothnagel's Practice, Diseases of the Lungs, p. 419.
[4] Ibid., p. 420.
[5] The Influence of Meteorologic Conditions in the Causation of Pneumonia, American Journal of the Medical Sciences, January, 1882.

York (embracing 600 cases) place the highest percentage of cases in February and March.

W. Ziemssen,[1] who studied extensive statistics in regard to the meteorologic factors in the causation of pneumonia, found that in all cities a short distance from the sea, spring and winter together give a percentage which is generally double that of the other six months. This observer is of the opinion that an insular climate should be distinguished from an inland climate; in the first, winter furnishes the highest number and summer the lowest, while in the centre of Europe the maximum occurs in spring and the minimum in autumn.

Says Linden:[2] "The southern hemisphere, in which the divisions of the seasons is the inverse of that of the northern hemisphere, pneumonia has its maximum frequency during the months in which it is most rare in Europe, and reciprocally. Thus at Brisbane, in Australia, pneumonia presents its maximum in August and September, and its minimum in January and February."

In Table II. is presented the monthly mortality list of cases of pneumonia covering the decade from 1894 to 1903, inclusive, for Philadelphia:

TABLE II.

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Summary.
1894	498	230	218	190	156	90	66	72	73	117	122	145	1977
1895	353	454	283	302	217	105	68	73	64	137	171	230	2457
1896	428	353	452	289	166	109	90	60	132	106	177	343	2705
1897	368	468	470	268	220	183	77	86	78	113	172	220	2723
1898	269	286	376	265	268	99	64	79	56	102	212	404	2480
1899	537	358	243	234	184	80	78	73	79	108	177	273	2424
1900	429	337	420	521	322	120	95	81	73	129	209	223	2959
1901	354	358	316	262	248	105	95	91	77	174	218	279	2577
1902	489	451	335	340	209	123	141	106	100	161	272	299	2976
1903	535	422	383	368	248	151	139	79	94	122	206	444	3191
Summary.	4210	3717	3496	3039	2238	1165	913	800	826	1269	1936	2860	26,469

The above table gives the death rate from pneumonia month by month for a period of ten successive years.[3] These obser-

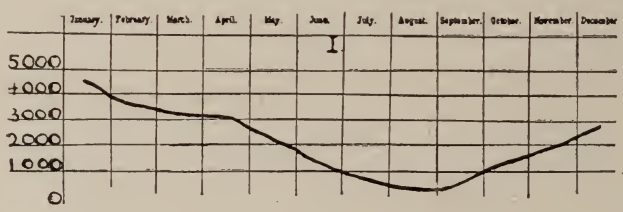
[1] Deutsche Klinik, 1857. [2] Zeitschrift f. klinische Medicin, 1889, Bd. xvi. p. 447.

[3] It is admitted that the mortality rate does not bear a constant relation to the totality of cases. Lobar pneumonia, however, is not a returnable disease in Philadelphia.

vations agree in the main with those of the authors previously cited. A glance at the figures indicating the total number of deaths during each month for the past ten years reveals the following numerical order: January (4210), February (3717), March (3496), April (3039), December (2860), May (2238), November (1936), October (1269), June (1165), July (913), September (826), August (800).

The average maximal mortality has occurred in the month of January and the minimal in August. The first quarter, or the months of January, February, and March, shows the highest death rate—11,423; the third quarter gives the lowest—2539. Again, the first six months of the ten years show 17,865 deaths, which is more than double the number for the last six months, or 8604. The calendar spring months, March, April, and May, do not show as great a totality of cases as the three winter months, December, January, and February, the figures being 8773 for the former period as compared with 10,787 for the latter.

CHART I.



This result is somewhat at variance with those of many writers who contend that pneumonia is a disease of spring rather than winter. W. Ziemssen has pertinently suggested that a distinction should be drawn between an insular climate and a continent climate: in the first, winter furnishes the highest number of cases and summer the lowest, while conversely in the centre of Europe the maximum prevalence occurs in spring and the minimum in autumn. Philadelphia probably partakes of the nature of both an insular and a continental climate. The accompanying graphic tracing based upon the sum of the cases indicates the rise and fall in the death rate during the year in Philadelphia.

According to my figures, there has been a slight increase or rise in incidence during the past decade. Decided exacerbations, traceable to epidemics of influenza, obtain, but quite independently of these outbreaks, the result of the present observations, as well as those of Seitz, Linden, Ziemssen, and other investigators furnish a real foundation for the belief, which has long since gained currency, that the etiological influence of the seasons is undoubted. We shall next inquire, What share of the combined effect of the various climatic elements, if any, is borne by each of the principal meteorologic phenomena ?

Alongside of an investigation into the question of the comparative influence exerted by the different meteorologic components that enter into the unfavorable season, which varies with the latitude, and keeping these in mind it is hoped that a clearer insight into the combined influence upon the prevalence of lobar pneumonia of the temperature range, the degree of humidity, the barometric pressure, and the velocity and direction of the wind currents, will be obtained.

EFFECTS OF CHANGE IN TEMPERATURE.

It is generally conceded that abrupt and marked oscillations of temperature are the most influential favoring factor. Cold, *per se*, however, is incapable of giving rise to the disease. Osler[1] states that in Montreal, January is the coldest month in the year, but with steady temperature has usually a comparatively low death rate from pneumonia.

Moreover, the mountain climate of the temperate zone has a reduced temperature, but does not show an increased incidence of pneumonia as compared with adjacent interior lowlands. On the other hand, the mean diurnal, monthly, and annual ranges of temperature are less than at sea level.

This question is closely related to the processes of physiological heat regulation in the human economy. Within certain limits a continuous low external temperature is consistent with health, but "a naked man cannot maintain his temperature in an

[1] Text-book of Medicine, p. 110.

external temperature below 27° C." (Lararus-Barlow). We know with certainty that the constancy of temperature in well persons is dependent on an equilibrium maintained by an interaction both of thermogenesis and thermolysis. With regard to the range of external temperature within brief intervals of time, however, our knowledge is as yet incomplete and unsatisfactory.

That the balance of heat production and heat loss may be readily disturbed beyond the limits of variation consistent with health, by wide, abrupt oscillations of the external temperature can scarcely be doubted, particularly if the existing mean range is low. The heat loss may suddenly become enormous, giving rise to a striking deep fall of body temperature unless the mechanisms that counteract thermolysis and bring about abnormal heat production be called into play. Hypothermia may result, as shown by coldness and pallor of skin, sensations of chilliness, cyanosis of the extremities, and a decided "sluggishness of nerve and muscle." This condition is pathological (and not to be compared with the sensations of cold so commonly experienced by healthy individuals), but whether it favors the invasion of the tissues by the diplococcus pneumoniæ is unknown, although from what is known on other grounds that it may do so would seem to be a reasonable inference.

Aufrecht[1] states that the prevalence of pneumonia is directly dependent upon the prevalence of unequal and changeable meteorologic conditions, especially on the occurrence of abrupt and marked changes of temperature at a time when the mean temperature is very low. Schramm[2] believes that the disease prevails in proportion to the extent of the changes in the external temperature and the velocity and variability of the wind currents.

Huss[3] states: "During the spring months the most rapid changes of temperature are noted not only from one day to the next, but during the different hours of the same day, and especially between day and night. These changes appear to be the plainest predisposing causes of the development of inflammation

[1] Loc. cit.
[2] Virchow-Hirsch. Jahrgang, XI., pro. 1876, Bd. ii., abtheilung, S. 563.
[3] Deutsche von Anger, Leipsic, 1861.

of the lungs, and, as they are more conspicuous in some years than in others, this probably explains the fact that in some years there are more cases of pneumonia than in others."

Hirsch[1] insists that the maximum incidence bears a certain relation to the temperature changes at particular seasons in certain localities. "In the countries situated in the higher latitudes (Russia, Sweden, Denmark, Germany, England, the northern districts of France, the northern United States of America), in which the most abrupt changes in temperature occur in spring, the maximum of the frequency of disease is noted in the spring. On the other hand, in the warmer and subtropic countries (Italy, the islands of the Mediterranean, Greece, Algiers, the southern United States of America, Chili, Peru), in which the previously mentioned meteorologic influence makes itself especially felt in the winter, the latter represents the especial pneumonia season."

Jurgensen,[2] after comparing monthly returns in Vienna for a series of years, concludes that sudden changes of temperature may exercise a limited influence in favoring the origin of pneumonia. Bouchard and Brissand,[3] on the other hand, point out that at Cologne the month of March in 1885 showed oscillations of 8.4° and gave 70 deaths from pneumonia, while in 1886 the same month furnished much greater oscillation, 13.8°, with only 45 deaths. It is but fair to interpret isolated instances of this sort as permiting of numerous exceptions.

From a consideration of my own figures (see Table III.), it is obvious that abrupt oscillations of temperature, *per se*, have a restricted influence, if any, as a favoring factor.

An inspection of Table III. proves that the months furnishing the greatest number of cases (January, February, March, April, May) for a decade are not those characterized by the most extreme daily and mean variations of temperature. Conversely, the months that show the most striking mean variations of temperature furnish the very lowest mortality rate from this disease in Philadelphia. It appears warrantable that sudden, great

[1] Loc. cit.
[2] Traité de Médecine (deuxième edition), tome vi. pp. 471–495.
[3] Loc. cit., p. 420.

ranges of the mercury of the thermometer during periods of existing low temperature exercise a more powerful causative influence than like changes during the warm seasons. Except this be granted, sudden, frequent, and decided oscillations of temperature do not rise to the dignity of a contributing factor, according to my investigations.

TABLE III.—TEMPERATURE.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Mean maximum.												
1894 . . .	42.3	38.5	55.8	60.0	73 0	82.3	86.8	81.4	77.2	64.5	48.3	42.7
1895 . . .	37.2	32.5	45.7	60.2	71.5	83.4	81.8	86.8	81.6	61.3	53.8	46.0
1896 . . .	36.6	41.5	43.9	64.5	76.7	78.6	85.3	85.6	76.2	60.2	58.3	41.3
1897 . . .	37.3	40.8	50.8	62.6	71.8	77.6	84.1	82.5	78.1	66.9	53.1	44.4
1898 . . .	41.2	42.9	56.4	67.9	69.7	82.2	87.1	84.4	79.9	66.5	51.3	42 0
1899 . . .	39.5	34.4	47.5	63.9	72.8	84.2	85.7	82.2	75.3	65.9	53.6	44.4
1900 . . .	42.4	40.4	45.6	62.6	73 5	81.8	88.4	88.0	80.1	68 5	55.8	43.3
1901 . . .	39.1	33.8	52.2	57.4	68 5	82 2	87.4	84.2	77.7	66.2	47.5	43.0
1902 . . .	38.5	35.6	54.7	60.9	72.3	79.9	84.0	81.4	74.7	65.8	58.1	40 0
1903 . . .	39.3	43.6	57.6	61.3	75 7	73.0	85.1	77.7	75.6	65.5	49.8	38.2
Mean minimum.												
1894 . . .	30.9	25.3	38.3	43.0	54 4	63.3	68.7	64.5	62.7	50.0	35.8	31.1
1895 . . .	24.0	18.6	30.5	43.1	53.3	64 8	64.7	68.1	63.1	44.0	39.8	32.3
1896 . . .	25.6	25.7	27.8	46.0	57.6	62.1	69.8	67.6	59.4	47.0	42.5	28.2
1897 . . .	24.2	29.7	35.4	42.7	53.5	60.2	68.6	66.2	58.7	49.6	38.7	31.8
1898 . . .	29.5	28.3	39.6	41.1	52.6	62.6	69.3	69.2	62.8	50.7	37.8	29.8
1899 . . .	25.1	21.7	33.9	42.8	53.7	65.6	67 7	67.0	58.7	51.2	39 0	30.6
1900 . . .	27.2	24.5	29.3	44.7	52.6	64.1	69.9	70.4	64.7	54.6	42.8	30.0
1901 . . .	27.1	20.5	33.4	42.8	52.5	63.0	71.1	69 6	61.3	48 0	35.0	28.8
1902 . . .	24.0	23.4	37.8	44.3	52 8	60.8	67.2	64.5	59.5	50 3	43.7	27.4
1903 . . .	26.0	29.4	41.2	45.2	55.5	58.5	67.6	64 2	59.7	50.2	35.2	25.3
Range of fluctuation.												
1894 . . .	11.4	13.2	17.5	17.0	18.6	19.0	18.1	16 9	14.5	14.5	12.5	11.6
1895 . . .	13.2	13.7	15.2	17.1	18.2	18.6	17.1	18.7	18.5	17.3	14.0	13 7
1896 . . .	11.0	15.8	16.1	18.5	19.1	16.5	15.5	18.0	16.8	13.2	15.8	13.1
1897 . . .	13.1	11.1	15.4	19.9	18 3	17.4	15.5	16.3	19.4	17.3	14.4	12.6
1893 . . .	11.7	14.6	16.8	16.8	17.1	19.6	17.8	15.2	17.1	15.8	13.5	12.2
1899 . . .	14.4	12.5	13.6	21.1	19.1	18.6	18.0	15.2	16.5	14.7	14.6	13 8
1900 . . .	15.2	15.9	16.3	17.9	20.9	17.7	18.5	17.6	15.4	13.9	13.0	12.2
1901 . . .	12.0	13.3	18 8	14.6	16.0	19.2	16.3	14.6	16.4	18.2	12.5	14 2
1902 . . .	14.5	12.2	16.9	16.6	19.5	19.1	16.8	16.9	15 2	15.5	14.4	12.6
1903 . . .	13.3	14.2	16.4	16.1	20.2	14.5	17.5	13.5	15.9	15.3	14.6	12.9
Average	12.98	13.65	16.30	17.56	18.90	18.02	17.11	16.29	16.57	15.57	13.95	12.98

Moreover, it is a well-established fact that in the temperate zones the diurnal temperature changes are most marked in summer and in clear weather. *Per contra*, this diurnal instability is equalled by the shifting storm winds in winter. Since the mean monthly and annual temperature in the middle and eastern United States show a large range, it is found that successive

lustra are not in perfect agreement. It was deemed advisable, therefore, to make a comparison with an identical previous period. (See Table IV.)

TABLE IV.—TEMPERATURE.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Mean maximum.												
1884 . . .	36.9	47.5	48.3	57.4	70.9	82.3	80 9	81 8	81.1	67.5	53.5	41.2
1885 . . .	38.2	31.5	38.6	60.9	69.0	80.8	87.8	81.6	75.8	63.4	51.9	44.6
1886 . . .	36.3	40.5	48.4	64.3	70.2	75.5	84.7	82.5	79.3	67.8	54.9	37.7
1887 . . .	39 5	42.4	43.8	60.4	78.3	81 1	89.0	82.0	71.9	64.0	53 2	43.8
1888 . . .	35.4	41.7	43.4	60.3	69.0	83.5	83.1	84.9	73 1	58.9	54.3	43.8
1889 . . .	45.0	35.9	49.4	61.4	72.1	83.0	83.1	80.9	73 5	60.1	53.2	51.0
1890 . . .	49.0	49.0	46.2	61.6	74 1	79.4	83.4	81.3	74.8	61.5	54.0	38.3
1891 . . .	43.2	46.8	45.2	63.4	70.1	81.8	80.0	82.0	80 3	62.8	51.6	50.7
1892 . . .	38.1	41.1	42.5	58.8	71.1	83.1	85.6	83.8	75.5	65.0	50.0	38.0
1893 . . .	30.2	38.5	46.4	58.9	69.6	81.4	86.0	84.8	73.8	65.4	50.2	42.9
Mean minimum.												
1884 . . .	23.5	32.8	35.5	40.8	53.2	60.9	63.9	65.6	61.7	48.8	36.5	28.2
1885 . . .	22.2	17.2	23.1	40.4	51.2	61.3	68.6	64.9	57.4	47 4	38.1	29.5
1886 . . .	23.6	23.3	31.9	44 8	52.8	60.5	66.8	66.2	60.8	50.6	38.6	25.0
1887 . . .	23.7	29.1	28.9	41.1	57.9	62.0	72 3	65.9	57.4	48.8	38.8	30.4
1888 . . .	20.2	26.1	27.0	41.8	53.5	63.2	64.7	66.7	58 5	44.4	40.4	30.4
1889 . . .	32.4	23.1	35.1	42.7	53.4	64.2	67.5	64.7	59.4	45.4	40.8	36.1
1890 . . .	34.3	33.9	31.5	44 8	55.3	63.3	65.7	66 0	59.6	49.5	38.9	26.0
1891 . . .	29.7	32.4	30.9	45.2	51.8	61.8	63.8	66.6	63.0	47.0	36.9	34.8
1892 . . .	24 8	29.3	29.1	43.0	52.7	65 9	67.6	67.5	58 0	47 9	37.3	27.5
1893 . . .	17.9	25.5	31.9	42.8	52.3	63.1	67.3	66.5	57.7	49.9	37.7	29.8
Mean daily range.												
1884 . . .	13.4	14.7	12.9	16.5	17.9	21.5	17.0	16.2	19.2	18.7	17.0	13.0
1885 . . .	15.9	12.2	15.5	20.5	17.8	19.5	19.3	16.7	18.4	15.7	13.9	15.1
1886 . . .	12.8	17.2	16.5	15.5	17.4	18.0	17.9	16.3	18.5	17.2	16.2	12.7
1887 . . .	15.8	14.2	14.8	19.3	20.4	19.2	16.7	16.1	14.7	15.2	14.4	13.4
1888 . . .	15.2	15.6	16.5	18.5	15.5	20.3	18.4	18.3	14.6	14.5	14.0	13.4
1889 . . .	12.6	12.8	14.3	18.7	18.6	18.8	15.5	16.2	14.1	14.7	12.4	14.4
1890 . . .	15 1	15.0	14.7	16.7	18.7	16.1	17.7	15.3	15.3	11.9	15.1	12.3
1891 . . .	13.5	14.4	14.3	18.2	18.3	20.0	16 2	15.4	17.3	15.8	14.7	15.9
1892 . . .	13.3	11.8	13.4	15.8	18.4	17.1	18.0	16.3	17.5	17.1	12.6	10.5
1893 . . .	12.3	13.0	14.5	16.1	17.3	18.3	18.7	18.3	16.0	15.5	12 5	13.1

A comparison of the figures in Table IV. with those in Table III., which give the mean maximum, mean minimum, and mean daily range of temperature for the succeeding decade (1893–1903, inclusive), will reveal a striking similarity in the results for the two periods of time covered by our observations.

The influence of the relative humidity of the atmosphere, more especially during seasons of variable meteorologic conditions in general has been emphasized by certain writers.

Seibert,[1] who drew graphic lines for each weather constituent for every month of three years in New York, found that a rise

[1] Loc. cit.

of this relative humidity of the atmosphere during "descending or existing low temperature was attended by an increased number of cases of pneumonia." If the relative humidity increases while the mercury of the thermometer is at the same time falling, and if this happens suddenly, then not only one but several cases of pneumonia will be found, even if the highest percentage is not above the mean—70 per cent. In other words, this writer holds that the sudden appearance and long prevalence of a cold, moist temperature especially influences the origin of croupous pneumonia.

It is generally conceded that similar conditions of the atmosphere favor the presence of tuberculosis, and, in short, bring about increased vulnerability or heightened receptivity to catarrhal states in general. Griesinger's[1] findings would appear to be diametrically opposed to this view; thus out of 212 cases which he observed in Munich only 4 gave a history of having contracted "cold."

THE INFLUENCE OF THE RELATIVE HUMIDITY.

Respecting the question of the effect of relative humidity of the air as a predisposing factor, and more particularly when considered in connection with the temperature range, it must be recollected that with a given absolute humidity the relative humidity will rapidly rise as the temperature falls, and *vice versa*. "An amount of vapor that is sufficient to produce only about 25 per cent. of relative humidity at a temperature of 80° will suffice to saturate the air when the temperature falls to 40°." (W. M. Davis.[2]) A study of the periodic ranges of relative humidity shows that it is usually the reverse of those of absolute humidity, except in the north polar regions, where both the relative and absolute humidity are often low. It is generally held that Continental interiors, in which the climate resembles that of the eastern part of the United States, are generally drier in summer and by day than in winter and by night.

[1] Deutsche Militararztliche Zeitschrift XI., Jahrgang, Heft 1 und 2.
[2] Elementary Meteorology, p. 146.

TABLE V.

Mean relative humidity (per cent.).

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1894 . . .	76	73	69	66	74	71	69	72	79	75	71	74
1895 . . .	76	68	63	68	70	72	65	66	67	61	78	70
1896 . . .	71	71	64	65	66	68	70	66	72	73	75	68
1897 . . .	74	76	70	63	62	66	78	70	67	72	72	77
1898 . . .	72	73	73	62	73	64	72	75	73	75	74	70
1899 . . .	71	77	74	59	66	66	71	74	73	76	72	69
1900 . . .	74	72	66	57	63	66	65	69	72	78	70	70
1901 . . .	73	66	70	66	72	66	74	78	77	69	63	75
1902 . . .	72	74	72	65	63	65	71	69	76	72	81	77
1903 . . .	73	71	75	65	70	77	66	78	77	72	65	65
Average	73.2	72.1	69.6	63.6	67.9	68.1	69.2	71.7	73.3	72.3	72.1	71.5
					Precipitation (in inches).							
1894 . . .	1.78	3.07	1.45	2.99	9.46	1.63	0.75	2.15	5.11	4.66	3.26	4.03
1895 . . .	4.52	1.39	2.61	6.14	1.72	3.15	3.23	0.59	0.61	2.97	2.32	1.76
1896 . . .	1.57	6.87	4.11	1.19	2.27	4 07	3.27	0.46	2.76	2.08	2.50	1.00
1897 . . .	2.17	2.97	2 03	2.03	4.33	4.53	7.70	3.52	1.10	1.70	4.44	4.52
1898 . . .	4.10	2.80	3.05	2.93	4.84	1.75	3.63	9.06	1.82	4.85	7.19	3.21
1899 . . .	4.01	6.20	6.47	1.04	2.30	1.09	4.69	5.18	3.66	1.98	1.93	1.41
1900 . . .	3.34	3.71	3.13	1 94	4.11	2.82	2.77	3.95	6.31	3.00	3.42	2.41
1901 . . .	2.47	0.86	3.39	4.77	4.05	1.15	4.88	9.42	3.68	1.51	2.64	6.72
1902 . . .	2.77	5.49	3.97	3.29	2.01	6.08	3 51	2.34	4.97	6.66	2.04	6.63
1903 . . .	3.52	4.29	4.38	3.00	0.93	5.48	3.84	5.57	2.31	3.86	1.03	3.29

TABLE VI.

Mean relative humidity (per cent. for each month).

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1884 . . .	73	80	78	82	87	80	78	76	68	68	68	75
1885 . . .	68	72	67	68	70	60	65	74	69	76	75	68
1886 . . .	74	72	68	74	73	73	73	77	70	67	61	71
1887 . . .	69	77	64	58	63	65	71	79	70	66	62	71
1888 . . .	71	70	67	53	70	63	66	70	79	72	76	69
1889 . . .	72	68	68	68	72	74	76	73	80	72	76	72
1890 . . .	68	74	68	61	69	64	68	76	78	74	70	69
1891 . . .	74	73	70	59	63	68	71	77	77	70	72	73
1892 . . .	73	71	65	61	71	73	68	73	75	76	73	73
1893 . . .	79	73	68	70	65	70	64	68	70	73	71	74

This statement is scarcely warranted, according to the results recorded below. (See Table V.) The explanation is not far to seek. Thus there may be very little moisture present in the cold northwest winds in winter. These come down from a northern interior region, where their temperature is very low and the air is equally dry. They advance into warmer latitudes so rapidly that their capacity for moisture is to a limited extent only satisfied. In a damp, cold atmosphere an uncomfortable reduction of temperature is readily experienced, more especially

when the body is not protected against loss of heat by an extra covering of clothing. Hence to maintain an internal temperature of 98.2° in the cold season, especially during changeable weather, becomes a difficult problem. *Per contra,* the degree of relative humidity determines largely the mean range of temperature, so that a fair degree of saturation of the atmosphere during the pneumonic season possibly exerts a favorable influence in that it tends to diminish the range of temperature.

Riebe[1] believes that an auxiliary cause of the disease in Posen is found in excessive humidity. On the other hand, Brunner[2] declares that the three months in which most cases arise are characterized by a minimum of atmospheric pressure and low relative humidity.

There is a paucity of comprehensive and reliable reports concerning the influence of the relative humidity upon the incidence of pneumonia furnished by the literature. I have been unable to investigate this phase of the question as thoroughly as could be desired, for the reason that the findings at the United States Weather Bureau at Philadelphia are taken only twice daily—8 A.M and 8 P.M.

The accompanying tables, based upon these night and morning observations, which are not regarded as conclusive in their results, yet show that the mean relative humidity is probably higher for the months furnishing the smallest number of deaths than for those giving the highest number. A moment's reflection affords reasons for believing that it is not the amount of vapor in the air that is the great predisposing cause of lobar pneumonia. With reference to the precipitation, it was observed that the greatest rainfall (see Table V.) often showed the lowest mortality, and, perhaps, never did a high mortality list coincide with excessive precipitation. As intimated above, greater value might have been attached to the results relative to the effects of the varying degrees of relative humidity, if the observations had been recorded at frequent intervals of time each day. In this way considerable variations may be detected, and they are due

[1] Loc. cit.

[2] Cited by Aufrecht, loc. cit., p. 422.

to convectional currents which convey masses of air from higher and lower levels alternately past the observer.

INFLUENCE EXERTED BY HIGH BAROMETRIC PRESSURE.

The influence of the barometric pressure is still, perhaps, *sub judice*, and opinions gathered from the literature respecting this question are divided. For example, Jurgensen holds that a high barometer is coincident with a diminished prevalence of the disease. Knovennagel,[1] on the contrary, states that an almost epidemically arising appearance of inflammation of the lungs is dependent on "dry air continued for a long time with high atmospheric pressure."

TABLE VII.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Highest barometer.												
1894 . . .	30.540	30.727	30 485	30.329	30 341	30.188	30.105	30.082	30.434	30.240	30.606	30.323
1895 . . .	30.382	30.427	30 403	30.537	30.235	30.353	30.130	30.168	30.258	30.462	30.546	30.049
1896 . . .	30.437	30.416	30.498	30.419	30.295	30.158	30.276	30.201	30.238	30.383	30.649	30.290
1897 . . .	30.584	30.495	30.646	30.532	30.267	30.132	30.196	30.074	30.274	30.506	30.490	30.442
1898 . . .	30 423	30.504	30.544	30.164	30.191	30.188	30.240	30.138	30.300	30 335	30.450	30.446
1899 . . .	30.827	30 543	30.345	30.278	30.229	30.170	30.154	30.163	30.310	30.431	30.376	30.532
1900 . . .	30.439	30.614	30.462	30.334	30.250	30.044	30.081	30.208	30.238	30 343	30.531	30.399
1901 . . .	30 640	30.238	30.243	30.363	30.059	30.097	30 092	30.095	30.379	30.507	30.353	30.414
1902 . . .	30.641	30.215	30.369	30.227	30.324	30.400	30.150	30.135	30.226	30.437	30 391	30.602
1903 . . .	30.463	30.649	30.472	30.334	30.367	30.233	30.047	30.299	30.334	30.203	30.594	30.429
Lowest barometer.												
1894 . . .	29.222	29.348	29.506	29.319	29.499	29.552	29.608	29.691	29.579	29.008	29.508	29.124
1895 . . .	29.172	29.168	29.387	29.235	29.523	29.678	29.627	29.624	29.609	29.429	29 323	29.444
1896 . . .	29.572	28.655	28.954	29.586	29 545	29.430	29.606	29.686	29.606	29.518	29.486	29.518
1897 . . .	29.457	29.482	29.191	29.427	29.487	29 558	29.530	29.591	29.718	29.543	29.318	29.175
1898 . . .	29.250	29.200	29.683	29.332	29.420	29.497	29 626	29.665	29.600	29.348	29.252	29.063
1899 . . .	29.249	29.265	28.882	29.488	29.562	29.693	29.694	29.653	29.569	29.507	29.312	28.980
1900 . . .	29.165	29.148	29.117	29.531	29.367	29 540	29 450	29.258	29.506	29.724	29.257	29.102
1901 . . .	29.074	29.447	29.189	29.122	29 390	29.639	29.680	29.736	29.530	29.514	29.268	29.370
1902 . . .	29.314	29.008	29.210	29 324	29.540	29.327	29.639	29.574	29.577	29.322	29.353	29.098
1903 . . .	29.213	29.071	29.419	29.227	29.767	29.485	29.486	29.608	29.623	29.436	29.409	29.174
Range.												
1894 . . .	1.318	1.379	0.979	1.010	0.842	0.676	0.497	0.391	0.855	1.232	1.098	1.199
1895 . . .	1.180	1.259	1.016	1.302	0.712	0.675	0.503	0.544	0.649	1.033	1.222	1.201
1896 . . .	0.865	1.761	1.534	0.843	0.750	0.228	0.670	0.515	0.342	0.865	1.163	1.276
1897 . . .	1.125	1.013	1.445	1.105	0 780	0.574	0.666	0.513	0.556	0.963	1.172	1.267
1898 . . .	1.173	1.244	0.861	0.832	0.771	0.691	0.614	0.473	0.700	0.987	1.198	1.383
1899 . . .	1.578	1.278	1.463	0.790	0.667	0.477	0 460	0.510	0.741	0.924	1.064	1.552
1900 . . .	1.270	1.466	1.345	0.803	0.883	0.504	0.631	0.450	0.732	0.619	1 274	1.297
1901 . . .	1.566	0.791	1.054	1.191	0.669	0 458	0.412	0.359	0 849	0.993	1.085	1.036
1902 . . .	1.327	1.207	1.159	0.903	0.784	1.073	0.520	0.561	0.649	1 065	1.038	1.512
1903 . . .	1.250	1.398	1.013	1.110	0.600	0.748	0.561	0.691	0.711	0.767	1.105	1.305
Average	1.256	1.279	1.186	0.997	0.745	0.656	0.653	0.500	0 607	0.944	1.142	1.302

[1] Deutsche Militararztliche Zeitschrift XI., Jahrgang, 1882.

In 1879 and 1880, 44 out of 80 cases of pneumonia for the entire year occurred during the short periods of raised barometric pressure. Stortz likewise found that the months during which the pressure was raised furnished the most cases of pneumonia.

Seibert[1] obtained contrary results ; he found in 78 per cent. of 600 cases that a more or less strong falling in the barometer had taken place during the three days prior to the reception of each case in the German Dispensary of New York. In the remainder the barometer had either ascended or remained stationary.

TABLE VIII.—BAROMETRIC PRESSURE.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Highest.												
1884 . . .	30.757	30.624	30.343	30.106	30 194	30.417	29.916	30.205	30.391	30.477	30.349	30.554
1885 . . .	30.729	30.398	39.357	30.477	30.187	30.182	30.078	30.164	30.276	30.215	30 250	30.640
1886 . . .	30.736	30.398	30.345	30.436	30.221	30.188	30.145	30.217	30.315	30.424	30.352	30.479
1887 . . .	30.54	30.82	30.63	30 55	30.22	30.22	30.09	30.19	30.35	30.88	30.70	30.81
1888 . . .	30.70	30.55	30.44	30.47	30 18	30.13	30.14	30 18	30.44	30.29	30.63	30.51
1889 . . .	30.50	80 73	30.28	30.37	30.26	30 24	30.14	30.18	30.21	80 28	30.56	30.75
1900 . . .	30.63	30.48	30.45	30.54	30 19	30 24	30 17	30.14	30.26	30.25	30.28	30.49
1901 . . .	30.416	30.583	30.445	30.407	30.300	30.109	30.241	30.118	30.297	30.06	30.713	30.486
1902 . . .	30.524	30.526	30.385	30.414	30.232	30.189	30.390	30.102	30.303	30.330	30.240	30.494
1903 . . .	30.337	30.684	30.488	30.378	30 256	30.190	30.131	30.103	30.207	30.406	30.534	30.255
Lowest.												
1884 . . .	29.002	29.169	29.393	29.097	29.496	29.624	29.494	29.601	29.634	29 658	29.300	29.431
1885 . . .	29.209	28.970	29.471	29.376	29.460	29 365	29.608	29.522	29.348	29 986	29.503	29.142
1886 . . .	28.571	29.175	29.179	29.251	29.469	29.415	29 622	29.520	29.599	29.698	29.378	29.388
1887 . . .	29.30	29.25	29.19	29.14	29.49	29.56	29.57	29.12	29.49	29.41	29.34	29.22
1888 . . .	29.49	29.37	29.24	29.45	29.59	28.60	29 54	29.30	29.52	29.37	29.20	28.91
1889 . . .	29.06	29.32	29.23	29.15	29.53	29 56	29.55	29.54	29.41	29.444	29.32	29.48
1890 . . .	29.52	29.48	29 19	29 36	29.49	29.68	29.60	29.56	29.76	29.31	29.53	29.29
1901 . . .	29.099	29.353	29.414	29.35	29.645	29.610	29.653	29.590	29.765	29.563	29.184	29.430
1902 . . .	29.180	29.342	29.216	29.525	29.481	29.590	29.632	29.637	29 586	29.469	29.345	29.451
1903 . . .	29.135	29.166	29.267	29.451	29.386	29 438	29.559	29.346	29.520	29.191	29.606	29.376
Range.												
1884 . . .	1.755	1.455	0.950	1.009	0.698	0 793	0.422	0.604	0 757	0.824	1.039	1.123
1885 . . .	1.520	1.428	0.886	1.101	0.727	0.817	0.470	0.632	0.928	0.229	0.747	1.498
1886 . . .	1 265	1 223	1.166	1.185	0.752	0 773	0.523	0.697	0.717	0.776	0.974	1 091
1887 . . .	1.24	1.57	1.44	1.140	0.73	0.66	0.52	0.57	0.86	0.97	1.36	1.59
1888 . . .	1.21	1.18	1.20	1.02	0.59	0 53	0 60	0.88	0.92	0.92	1.43	1.60
1889 . . .	1.44	1.41	1.05	1.22	0.73	0.78	0.59	0.54	0.80	0.84	1.24	1.27
1890 . . .	1.11	1.00	1.26	1.18	0 70	0.57	0.57	0 58	0.50	0.94	0.75	1 20
1901 . . .	1.317	1.230	1.031	1.057	0.655	0.499	0.588	0.528	0.532	0 843	1.529	1.056
1902 . . .	1.344	1.334	1.174	0.889	0 751	0.599	0.758	0.465	0.717	0 861	0.955	1.043
1903 . . .	1.202	1.518	1.221	0.927	1.020	0.752	0.572	0.757	0.689	1.215	0.928	1.379

The investigations of Linden[2] at Stockholm and at Helsingfors showed results that agree with those of Seibert. Thus, in 1887, the least barometric pressure furnished the highest number of cases, the increase at Stockholm being 9.8 per cent., at Helsing-

[1] Loc cit.

[2] Loc. cit.

fors 7.2 per cent. Linden also carefully noted the influence of the variations of barometric pressure within given months, and found that the months in which these changes reached their widest limit furnished obviously the most pneumonias—14.5 to 100 in Stockholm, and 16.1 to 100 in Helsingfors.

It is in respect to this meteorologic component that my investigations yielded strikingly uniform as well as significant results. (See Tables VII. and VIII.)

The monthly range of barometric pressure for the decade from 1894 to 1903 corresponded closely with the death rate. (Compare Tables VII. and I.) Then the months in which the highest death rate occurred gave the maximal monthly barometric range, and, *vice versa*, those months showing the minimal barometric pressure gave the lowest death-rate.

It is to be recollected that the atmospheric pressure is higher in January than in July in Continental interiors and over the eastern part of the United States. It cannot be said that the distribution of pressure is wholly determined by that of the temperature, since low pressures are met with in polar regions. The expected high pressure at the poles may be, as suggested by Davis, reduced to low pressure by the excessive centrifugal force of the circumpolar whirl of the winds. In general, however, the continents have low pressure in summer and high pressure in winter (Davis). The regions of elevated temperature cause the air to expand, and as a consequence the upper layers pass off to more northerly areas of lower temperature. There are, however, tropical belts of high pressure for which no adequate explanation has been advanced. The question, Do these high-pressure belts show a high incidence of pneumonia cases similar to that which occurs during the seasons of maximum pressure in temperate climes? is pertinent. No answer to this question can be rendered at present writing.

At first sight it would appear that the higher percentage of cases in winter and spring is dependent upon the increased barometric pressure during these seasons; but it must berecollected that this comparatively high pressure is merely the result of condensation of the atmosphere in consequence of existing low

temperature and the contained moisture, and may, therefore, not stand to pneumonia in the relation of cause and effect.

The principle pneumonia season coincides in point of time with the anticyclonic systems not only over the Western Hemisphere, but also the vast continent of the Eastern Hemisphere (formed by Europe and Asia). In equatorial regions the annual variation in atmospheric pressure is slight, indeed, owing to the constancy in the temperature and humidity. It is found that the diurnal range of pressure is also highest or most clearly perceptible during anticyclonic weather, especially in spring time, when the air is dry and the thermometric changes most pronounced. This is not the season of highest incidence of pneumonia cases in insular climates, and not in Philadelphia, according to our investigations.

INFLUENCE EXERTED BY THE WINDS.

The influence of the winds or severe draughts is etiologically important in the view of some authors. Individual instances are recorded in which severe winds appeared to exercise more or less control as predisposing agencies. The writer may be pardoned for referring to a case in his own person at the age of seventeen years ; it developed during exposure to a damp, chilly, penetrating northeaster. It is conceivable that the severe cold winds by rapidly abstracting the heat of the body, especially if the latter be unprotected by sufficient clothing, may induce susceptibility, although its duration may be brief. A greatly reduced temperature of the body combined with muscular exhaustion, as seen among recruits, unquestionably exercises a controlling influence in determining susceptibility.

Welch[1] holds that the part played by exposure to strong winds or severe draughts may be of signal importance. He writes : "Pneumonia occurred in a battalion which had been stationed for six years at a Mediterranean port and was transferred from there to North America during raw winter weather. Of these troops 330 men were stationed in a frame building, which, no

[1] British Army Medical Report, 1867, quoted by Hirsch, Hist Geogr. Pathologie, 1881–1882, Aufl. Bd. iii. p. 96.

doubt, would have been very habitable in the summer season, but in the winter did not give sufficient protection against the weather, as it was exposed on every side, and the thin walls through their numerous cracks gave the wind free access to the interior; 246 men were stationed in well-protected barracks and 66 married soldiers found quarters in the city. Among the men stationed in the wooden building 38 developed pneumonia, whereas among the other soldiers only 3 had pneumonia, which might easily be referred to the influence of the weather. The severest cases among those in the wooden building occurred in those living in the upper rooms, which were most exposed to the sharp winds coming from the north and west. The disease unquestionably arose from the fact that during the night the body was exposed to a draught and to the general low temperature."

TABLE IX.—AVERAGE HOURLY VELOCITY FOR THE MONTH (IN MILES).

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1894 . . .	10 3	12.3	10.2	12.1	10.6	9.0	9.3	7.9	9.7	10.6	10.7	10.1
1895 . . .	11.0	12.5	12.1	11.6	9 6	8.4	9.0	8.9	9.4	10 8	10.0	11 4
1896 . . .	10.9	13.8	13.9	10.3	9.8	8 9	10.0	8.2	9.9	10.2	9.9	9.8
1897 . . .	11 3	11.0	10.9	10.9	11.4	10.1	8.4	7.6	9.5	10.7	9.7	10.2
1898 . . .	10,5	10.3	9.9	12.3	9.8	9.5	8.5	8.3	8.6	9.7	10.2	10.6
1899 . . .	10.7	11.6	12.2	9.7	9.3	9.2	9.6	8.6	8.7	8.5	9.0	10.2
1900 . . .	10.1	11.2	12.0	11.4	10 2	8.7	8.7	7.4	8.4	9.0	11 0	9.3
1901 . . .	11.1	12.9	13.0	14.1	10.8	9.2	9.4	8.5	8.4	9.5	12.3	11.6
1902 . . .	11.4	13.9	13.0	11.6	10.8	10.8	9.7	8.7	9 2	10.8	10.4	12.0
1903 . . .	10.9	10.2	10.4	11.9	9.6	9.0	9.4	7.0	8.3	12.4	10.1	12.3

An analysis of the accompanying table (see Table IX.), which gives the average hourly velocity for each month in miles covering a period of ten years (1894–1903, inclusive), shows that the mean velocity corresponds with the mean death rate, thus holding practically the same relation to the fatality of pneumonic fever as the mean atmospheric pressure. A reference to Chart No. XI. will serve to show how nearly parallel are the mortality line, barometric pressure curve, and that of the winds in their seasonal course.

It is well known that the influence of winds upon climate is well marked; they may influence the temperature and humidity and interrupt sunshine by creating clouds, or render the sky clear when falling from the higher strata of the atmosphere. Attention

has been called to the fact that the winds accelerate evaporation from the surface of the body, and Dr. C. Theodore Williams well says that "they serve a distinct hygienic object in dispersing noxious exhalations, whether animal or vegetable, in permitting free evaporation, and thus preventing the accumulation of moisture and maintaining the circulation of the air which is necessary for the purification of the atmosphere."

TABLE X.—PREVAILING DIRECTION OF WINDS.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1894 . . .	N W	N E	N W	N W	S W	S W	S W	S W	S W	N E	N W	N W
1895 . . .	N W	N W	N W	N E	N W	N E	N W	S W	S W	N W	N W	N E
1896 . . .	N W	N W	N W	N W	S W	S W	S W	S W	S W	N	S W	N W
1897 . . .	N W	N W	N W	N W	S W	N W	S	N W	S W	N E	N W	N W
1898 . . .	N W	N W	N	N W	N E	S W	S W	S W	S W	N W	N W	S W
1899 . . .	S W	N W	N W	N W	S W	S W	S W	N E	S W	S W	N W	N W
1900 . . .	N W	N W	N W	N W	S W	S W	S W	N	N W	N E	N W	N W
1901 . . .	N W	N W	N W	N E	N E	S W	S W	S W	N	S W	N W	N W
1902 . . .	N W	N W	N W	N W	S W	S W	S W	S	N E	N W	S W	N W
1903 . . .	W	N W	S W	N	N E	S E	W	S	N	N	N W	N W

An examination of Table X., which indicates the prevailing direction of the winds, fails to reveal a constant connection between their mean monthly course and the mortality list from this disease. In general, however, the northwesterly winds were found to coincide with the principal pneumonic season. Conversely, isolated months, during which a southwest wind prevailed, gave unusually high mortality rates. In the winter of 1898–99 the same conditions obtained for December and January, but it must be recollected that a severe and widespread grippe epidemic was at its height during the two months just named, and doubtless caused in a measure, at least, the exaggerated death rate of pneumonia for the same period. From the foregoing considerations the assumption is warrantable that, as a rule, the direction of the wind (northwest) bears a close relation to the period of maximal mortality from pneumonia.

By throwing the foregoing numerical results into curves or tracings we can best correlate the influences of the several meteorologic phenomena. It will be observed in the various charts (I. to X. inclusive) that the temperature is inversely as the death rate from this disease, while the barometric pressure

and average velocity of the winds practically parallel the rise and fall of the mortality line. Quite different are the facts with reference to the relative humidity of the atmosphere; this line clearly disproves any noticeable effect upon the seasonal mortality from lobar pneumonia.

The unusually severe and variable weather in Philadelphia of the winter of 1903–04 just closed has been held responsible by certain health officials for the concurrent high death rate from lobar pneumonia. It was therefore deemed a matter of practical importance to investigate the question statistically, following the same lines as in the foregoing observations. (See Table XI.) It is to be observed that the weekly ranges of the different meteorologic elements are indicated by the figures instead of the monthly range as in the previous table.

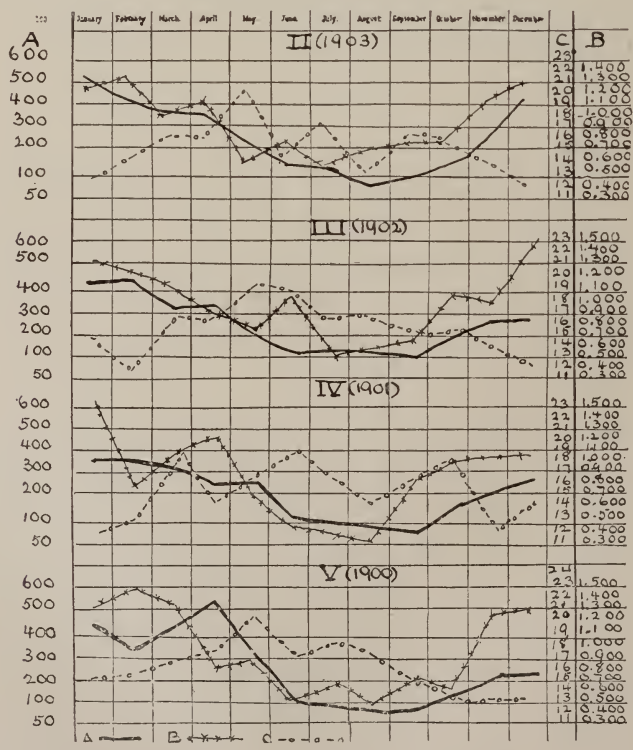
TABLE XI.

Weeks ending,	Dec. 5	Dec. 12	Dec. 19	Dec. 26	Jan. 2	Jan. 9	Jan. 16	Jan. 23	Jan. 30	Feb. 6	Feb. 13	Feb. 20	Feb. 27
Death rate,	61	97	94	97	95	94	93	80	66	69	59	90	87
Temp. range,	8.5°	10.6°	15.4°	12.0°	16.4°	11.5°	11.1°	15.5°	11.2°	17.5°	17.3°	15.0°	17.8°
Baromet. "	0.16	0.34	0.28	0.33	0.31	0.32	0.34	0.34	0.34	0.37	0.22	0.26	0.38
Rel. humidity,	76 8	65.2	59.2	65.5	69.5	70 5	73.0	73.7	70.4	67.7	62.5	67.5	67.9
Mean average hourly velocity of winds,	10 4	9.6	12.1	14.3	12 3	9.8	12.6	12.0	11.6	10.5	13.1	12.1	11.8

The curves (see Chart XIII.) graphically representing the figures are based upon a scale which likewise differs materially from previous charts. These graphic lines do not bear to one another as close an interrelation as do those previously recorded. (See Chart XII.) The death rate was no higher for most of the weeks represented in the table than in previous years, while the mortality line in Chart XIII. as well as those indicating the barometer, temperature, and relative humidity are at variance with similar tracings based upon the mean monthly ranges for the preceding ten years. During the months of December and January, however, the barometric pressure and the temperature maintained about the same paral-

lelism to one another as indicated in previous diagrams, but an inspection of the table will show that this relation was totally lost during the latter part of January and the beginning of February. Conversely, the relative humidity follows more closely the death line than in the ten-year observations recorded above. The curve indicating the average velocity of the winds is wholly at variance with the corresponding line in the previous composite diagram. In view of the results obtained, it is clear that the data gained from the observations covering the brief period of three months are no aid to the solution of the question of the relation of weather phenomena to the disease in question.

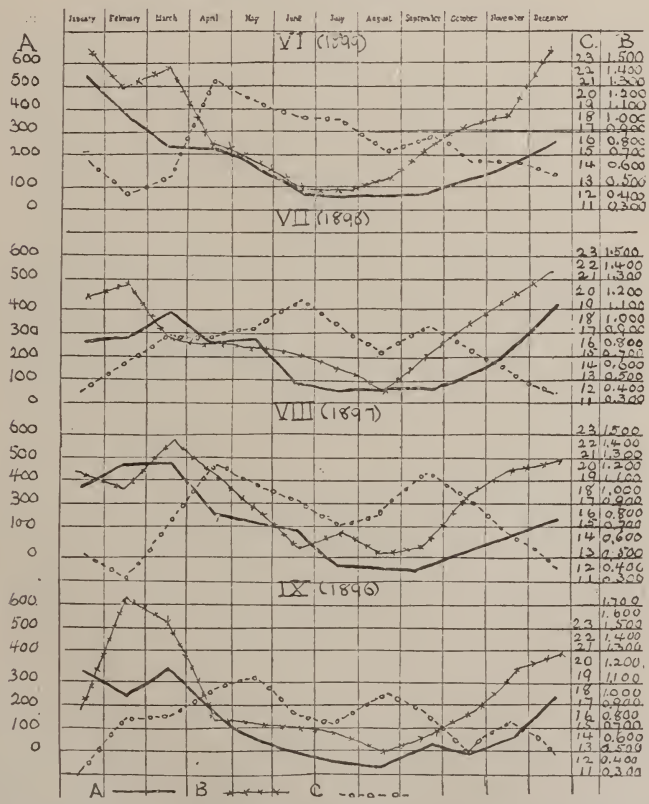
CHARTS II., III., IV. AND V.



Although the death rate from pneumonia may be largely independent of climate, yet the seasons of the year exert a marked

influence upon pneumonia prevalence. Coincident with influenza epidemics, and under other circumstances, extensive outbreaks of pneumonia may appear at all seasons; but almost regularly with each recurring autumn the mortality curve rises, reaching its topmost level in January, rarely later, and declining slightly during spring, then more rapidly from a commencement of summer onward until August, when the lowest level is reached. (See charts.)

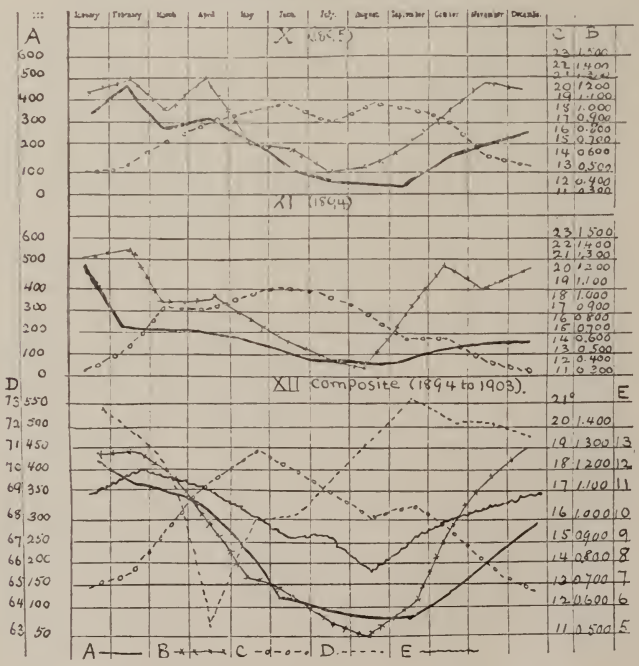
CHARTS VI., VII., VIII. AND IX.



It may be questioned whether the increased prevalence of pneumonia which occurs annually does not commence and advance quite irrespective of any direct effect of the meteorologic

elements. Is pneumonia less or more essentially a disease of winter and spring than smallpox? May we not have assumed a potent, predisposing effect of the weather influences in this disease to exist for the reason that the air-passages are the seat of the principal lesions, or rather because formerly pneumonia was regarded as being a local disease of the lungs? J. W. Moore[1] has been shown that variola and typhus are essentially diseases of winter and spring.

CHARTS X., XI. AND XII.



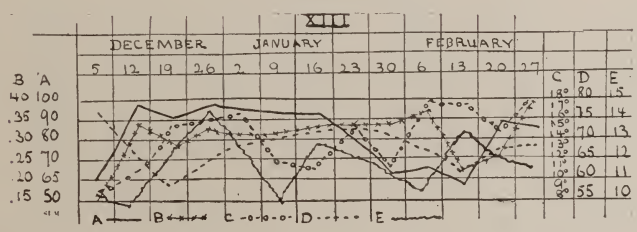
In response to a letter of inquiry, Dr. W. M. Welch, of Philadelphia, stated it as his belief that smallpox is more often epidemic in winter, because the infectious principle multiplies more rapidly in houses from which the free circulation of air is excluded. In summer, when the windows and doors of dwell-

[1] Meteorology, Practical and Applied, p. 383.

ings are opened, the poison is attenuated or diluted constantly, and hence its striking distance is lessened. He continues: "I do not feel that the spread of smallpox is influenced by climate, *per se*. If houses had neither doors nor windows I do not believe that the disease would be more prevalent in the winter than in the summer."

May not the higher incidence of pneumonia in winter and spring be due not so much to the direct effect of the low temperatures, augmented barometric pressure, and velocity of the winds, as to the closer confinement of the populace in-doors, in the stagnant air of living rooms from which the sunlight is excluded, and which tends to lower vitality and decrease resistance on the one hand, and to favor rapid multiplication and increased virulence of the specific poisons on the other.

CHART XIII.



Moreover, "pneumonia, like other acute infections that prevail epidemically, shows a wave-like character, on comparing different years for the same locality. Exclusive of epidemic outbreaks, there is an evident tendency to a preponderating incidence in overcrowded districts, and among the impoverished classes. Thus the average mortality rate for four years in New York (see Table XII.), taking the eight wards which are most densely populated, from the tabular list, is 18 per cent.

"The Fourth, Sixth, Seventh, Tenth, Eleventh, Thirteenth, Fourteenth, and Seventeenth Wards of New York city were embraced in this estimation. In contrast with the figures just given, eight wards representing the most sparsely settled portion of the city of New York—*e. g.*, First, Fifth, Eighth, Ninth, Fifteenth, Sixteenth, Eighteenth, and Nineteenth—gave for the

same period of four years an average mortality of 14.3 per cent. It was observed in the compilation of these mortality statistics that an elimination of the epidemic periods would make the differences in percentage dependent on the population somewhat greater."[1]

TABLE XII.

Ward.	Area in acres.	Population U. S. census of 1900	Population per acre.	Percentage of deaths from pneumonia.			
				1899	1900	1901	1902
First	154	9,516	62	11.2	11.8	10.9	12.1
Second	81	1,488	18	2.9	9.1	11.5	7.1
Third	95	1,797	19	10.3	9.6	12.9	10.5
Fourth	83	19,554	222	20.4	22.8	18.0	20.1
Fifth	168	8,298	49	12.1	15.3	15.5	12.6
Sixth	86	20,004	266	18.8	18.0	15.8	20.4
Seventh	198	89,237	451	16.9	17.5	16.0	17.1
Eighth	183	29,059	159	15.4	16.9	15.0	19.0
Ninth	322	59,650	185	13.1	15.3	13.4	12.9
Tenth	110	71,879	638	18.1	15.8	15.5	16.9
Eleventh	196	99,144	443	18.2	18.4	17.4	18.0
Twelfth	5504	476,602	86	12.8	15.2	12.7	14.4
Thirteenth	107	64,117	550	21.6	23.7	18.3	21.3
Fourteenth	96	34,035	332	18.2	20.7	22.4	20.1
Fifteenth	198	24,066	122	14.1	21.4	14.0	18.6
Sixteenth	349	52,808	123	12.1	13.2	11.1	12.3
Seventeenth	331	130,796	395	13.8	17.3	13.7	17.2
Eighteenth	450	61,325	163	11.2	13.2	10.8	12.2
Nineteenth	1481	257,448	174	12.0	16.7	14.4	11.4
Twentieth	444	89,798	202	13.7	13.0	12.3	11.9
Twenty-first	411	60,211	147	12.9	16.4	12.9	13.6
Twenty-second	1529	189,261	124	13.7	14.5	12.0	12.8
Average per ct.	.....	.....	.....	13.9	16.0	13.8	14.4

Here stress should be placed upon the direct transmissibility of pneumonia. Beverley Robinson[2] insists that lobar pneumonia is contagious, and every clinician of wide experience can bear corroborative testimony to this view.

The epidemiologist has emphasized the disappearance of certain diseases as plague, leprosy, and to a lesser extent malaria and diphtheria, as the result of the advances of civilization and the march of scientific discovery. Conversely, pneumonia, the cosmopolitan disease which can, therefore, scarcely depend in an especial manner upon climatic conditions, would appear to find all the physical conditions necessary to its well-being in the

[1] Journal of the American Medical Association, May 9, 1903, p. 1291, by the writer.
[2] Lancet, April 16, 1898.

more highly civilized communities, and more especially during seasons of low temperature. It is generally supposed that the pneumococcus is air-borne, and it is known to grow on all artificial culture media at temperatures ranging from 24° to 42° C.

It is scarcely conceivable, in view of the foregoing fact, that the climatic conditions prevailing during the cold season should constitute a special requirement of the organism in question. It must be confessed, however, that we are sadly in need of knowledge bearing upon the extracorporeal phases of the pneumococcus and other infecting microbes and their transmitting agencies.

We have no evidence that the external climatic conditions which are believed to be of etiological importance in this disease exercise an effect upon the bacteriological factors, influencing the occurrence of infection. While any direct influence of climate upon the infecting microbe cannot be allowed to exist, it is reasonable to suppose that the condition of the house-air in winter often favors the multiplication of the micrococcus lanceolatus, and thus bring about an increase in the incidence of pneumonia. But the personal element cannot be wholly ignored, since "the body itself varies at different seasons" (Lazarus-Barlow). For example, it has been found that the antagonism of certain drugs (atropine, aconitine) shows marked differences as the result of animal experimentation at different seasons of the year. Unfortunately, however, but little help is rendered by laboratory experiments in explanation of the seasonal prevalence of the disease.

In a previous article[1] may be found a table which comprises all necropsied cases of lobar pneumonia at the Philadelphia Hospital for a period of six years, from January 1, 1896, to March 1, 1903. It was found that "out of a total of 275 cases 250, or about 90.9 per cent., showed cardiovascular lesions, principally chronic endocarditis and general atheroma of the vessels. A small number of the cases, 14, or 5 per cent., showed acute plastic pericarditis, and 11, or 4 per cent., chronic pericarditis. Renal lesions were recognized in 90.5 per cent. of the

[1] Loc. cit.

totality of cases. Chronic interstitial nephritis was noted in 145, or 52.7 per cent.; chronic parenchymatous nephritis in 50, or 18 per cent., and acute nephritis in 38, or 13.8 per cent. Among the remaining 25 cases was one of renal calculus, another of renal tuberculosis, and in many of the remainder subacute nephritis was noted. These figures afford strong presumptive evidence that renal and cardiovascular degeneration rank as potent, predisposing conditions and clear and convincing proof that they bear a close and vital relation to the high mortality rate of lobar pneumonia.

In this connection the frequency of arteriosclerosis at autopsies in death from all causes is to be noted for the sake of comparison; out of a list of 1600 cases at Charing Cross Hospital it occurred in 380, or about 25 per cent. In 142 autopsies recently made by H. B. Anderson[1] in Toronto, including patients at all ages, he found evidences of arteriosclerosis in 83, or about 58.5 per cent.

Besides the atmospheric conditions and the in-door influences that presumably favor the pneumonic prevalence, other causative factors are also at work, and these cannot be disregarded. As elsewhere shown and pointed out above, bodily receptivity to both lobar and lobular pneumonia is greatly increased by the occurrence of epidemic influenza.[2] H. S. Anders[3] and others have shown that the incidence of epidemic attacks of influenza have almost invariably occurred during the months recording normally the highest barometric pressures, December, January, and February. It is a matter of common observation, however, that the multiplication of cases of influenza during the propagation of epidemics of this disease are principally the result of contagion. I have a fixed belief that as pneumonia so influenza is propagated by the stagnant vitiated air of closed dwellings during the cold season.

The foregoing numerical results and facts warrant the following inferences:

[1] The Etiology and Pathology of Arteriosclerosis, American Medicine, March 12, 1904.
[2] Philadelphia Hospital Reports, vol. iii. p. 59.
[3] Transactions of the American Climatological Association, 1902, vol. xviii. p. 34.

1. That the seasons exert a marked effect upon the prevalence of lobar pneumonia, the maximal mortality being observed during the winter and spring months.

2. That insular climates probably manifest the greatest rise in pneumonia mortality in winter, while that of Continental climates coincides mainly with spring.

3. That the mortality of the epidemic form of the disease is to a less extent influenced by the seasons, and may occur in the fourth and even third quarter of the year.

4. That an apparently close relationship exists between periods of low temperature and the death rate from pneumonia.

5. That the mortality rises and falls with the barometric pressure, the maximal level being reached during periods of highest pressure, and *vice versa.*

6. That the average velocity of the winds and the death rate from this disease would appear to stand to one another in the relation of cause and effect (a provisional explanation of this fact being found in the controlling influence exerted by the winds upon temperature and barometric pressure).

7. That the coincidence of existing low temperatures, high barometric pressure, the direction and velocity of the winds, and maximum mortality from pneumonia is so uniformly constant to merit serious consideration and suggest a close relation as between their combined influence and the progress of mortality from pneumonia.

8. That the mean relative humidity of the atmosphere shows equally decided variability during the periods of abeyance in the prevalence and fatality of the disease with that of the cold or annual pneumonic season.

9. That the major influence exerted by the seasons, however, is probably not direct—*e. g.*, by a lowering of the bodily resistance due to low temperature, high barometric pressure, direction and velocity of the winds, etc.—but indirect, namely, by bringing about that effective element in the causation, concentration and increased virulence of the specific poison in consequence of closed doors and windows and lack of free ventilation.

SOME UNSETTLED AND IMPORTANT PROBLEMS IN THE TREATMENT OF ACUTE LOBAR PNEUMONIA.

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To the practitioner of medicine there is no subject of greater interest than the treatment of pneumonia. This interest proceeds from the facts: first, that pneumonia is met with frequently, in all climates and seasons, everywhere, in hospitals and in private practice; second, it is a very fatal disease, of rapid course, and of markedly infectious type at times; third, it has been the subject of a great number of books, papers, discussions from the ablest and most experienced physicians in the past and at the present time; fourth, while there is a consensus of good medical judgment as to the efficient cause of pneumonia, as to many accidental and co-operating causes, as to certain indications of treatment, and as to usual causes of death due to it, there still remains much that is undetermined in its treatment, and about which many "good men and true" hold divers opinions.

In my remarks I wish to be understood as limiting the discussion, as far as possible, to acute lobar or croupous pneumonia, with a consideration solely of the usual dangers or complications occurring in its course.

I would merely add for additional clearness in the beginning that certain cases of pseudolobar pneumonia are with difficulty differentiated from the true form, either by symptoms or by physical examination. It is true that the début of the pseudo form, the temperature chart, the previous bronchitis, the absence of herpes and flushing of the face, the bacteriological findings of several kinds of micro-organisms, and not merely the pneumo-

coccus of Fraenkel, and the isolated areas of consolidation preceding, it may be, and probably recognized before the lobar consolidation is formed, will permit, as a rule, an accurate differentiation to be made. And yet there are cases, as I believe, in which the most careful clinical observer may remain somewhat undetermined as to which form of disease he has to do with for one or more days. Indeed, the autopsy alone has in rare instances definitely solved reasonable doubts.

In this discussion I do not propose to deal with statistics of my own, or even of others, which I might readily obtain. This has been done already many times, and in the aggregate in a vast number of cases. I regret to say that the resultant figures have not been very encouraging, nor have they shown great progress in treatment, nor have we seen, apparently, the virulency or the mortality of the disease decrease, if we carefully consider the records of a certain period of years in the same or different places. Besides, it must be admitted that statistics as made, unfortunately, do not tell, never will tell, perhaps, precisely what should be a true and proper estimate of prognosis in any given case of pneumonia. Personally, circumstances, antecedents, temperament, constitutional peculiarities or defects, all differ or are of untold variation. Again, as we all know, epidemics of pneumonia, as the endemic, sporadic sort, show more or less virulence or intensity of poison, depending upon causes, of which we know now, as heretofore, very little in an accurately scientific manner.

Before I speak of problems in curative treatment, let me say a few words in regard to prevention of pneumonia. I do not wish to dwell on facts about which we are all pretty nearly agreed, namely, to avoid excesses, overfatigue, chill, bad air, etc., but upon some which later investigations of others and personal observations render valuable.

We know to-day that the pneumococcus is found in the secretions of the throat and mouth of many healthy people, and for long peroids of time. One or more of the contributive causal conditions referred to may render these micro-organisms virulent or infective. Is it not specially indicated, therefore, to make use

of antiseptic gargles and mouth-washes frequently when we have reason to fear the possible beginning of pneumonia? This antiseptic mouth-wash, at such times, should have a slightly acid reaction, simply because we know that the pneumococcus does not thrive in an acid medium. Incidentally, I should add that, on account of the deleterious action upon the teeth, I do not approve of a mouth-wash of acid reaction to be used habitually in a condition of normal health.

With the first symptoms of chill, fever, pain in the side, cough, and expectoration, I believe beechwood creosote should be vaporized more or less continually in the patient's room. I am confident there is no drug used in this way which has more preventive value in the treatment of pneumonia. Of course, I cannot prove to others that several times already by this means I have prevented in private practice, as I believe, what otherwise would have become pneumonia. Whether it would have become croupous pneumonia or bronchopneumonia, I am not prepared to say, except in a hesitating way and with, it may be, a conviction tending toward the latter opinion.

I wish it to be understood that I only give to creosote a very slight or moderate antiseptic power locally; but I know it is an anticatarrhal agent of great value directly and by elimination through the bronchial mucous membrane. Further, I am thoroughly convinced it is the best way to give creosote so as to obtain its constitutional effects without disturbance of the stomach, and, as a rule, without injury to the kidneys. It is wise, of course, if creosote be used freely in inhalations to examine the urine carefully and frequently for an appreciable amount of albumin. If this be present we should try to determine its cause, whether it be the result of the pneumonia or of the action of the creosote, and act accordingly.

Occasionally creosote by inhalation used too freely gives headache to the patient or to the nurse. In this case it should be intermitted for a few hours, perhaps, and the room thoroughly ventilated. It is also my belief that creosote thus used prevents the taking of pneumonia by the nurses in attendance or by any near relative very constantly in the room.

The degree of risk of contagion in *the air* is, of course, a questionable matter, and for my part, in the majority of instances I doubt the reality of it. In other exceptional instances and in certain epidemics, when the pneumococci are more abundant or more virulent, or both, than usual, the transport of the noxa of the disease through the air no doubt occurs, and may be best neutralized primarily by insisting upon having the vapors of creosote in the room. Of course, the sputa should be rigidly and systematically disinfected, and the lips and other parts of the face which have been soiled with them properly cleansed. So, also, must all soiled garments and bedclothes be suitably disinfected upon removal, and after the recovery or death of the patient the furniture and room should be properly fumigated, cleansed, and ventilated, just as we should do in the case of any other possibly virulent contagious and infectious disease. The sputa should never be allowed to become dry, but should be received in a convenient receptacle containing a solution of carbolic acid or bichloride of mercury. If the pneumonia becomes developed, I believe antiseptic mouth-washes and creosote inhalations should be continued throughout the acute stage of the disease, and, indeed, until the local consolidation has been resorbed.

The necessity of a large, well-ventilated room, with open fireplace, if possible, of two well-trained, careful, judicious, and attentive nurses, of proper assimilable food (mainly milk), of a sufficient quantity of good drinking water, and of due attention to the emunctories, namely, the skin, bowels, and kidneys, is all important, but need scarcely be insisted upon with my audience.

Now we come to some points of judicious curative treatment of pneumonia which are very important, and about which, also, there may be very different judgments. Among the poor it is difficult, almost impossible, to treat pneumonia as it should be treated, because of the lack of proper surroundings and nursing, not to speak of food, drugs, and very good medical care. Under these circumstances is it proper to transport the patients to the hospital? In general, if the patient be seen at the beginning of the attack, I believe we should do so. Later, at the third, fourth, or fifth day of the disease, to my mind, it is often questionable.

Once in the hospital bed such a patient will undoubtedly get better care than at home, and on this account has a better chance of recovery.

On the other hand, when we consider the fatigue, the exposure, the unavoidable nervous upset incident to this change, it becomes a nice question to decide at times, and there is no absolute rule to lay down in advance. The patient and the doctor must decide. If the patient still be reasonable and not too critically ill he may go to the hospital, if he desires, and the doctor may consent; if the hospital is not too far removed, an ambulance be had, proper stimulants be given before removal, the patient be thoroughly covered, and the removal be conducted in a quiet, expeditious, and thoroughly efficient manner. If the room and surroundings be tolerable and the care of the patient be fair, although not of the best, proper duty to the patient must be decided upon and carried out, after careful and due consideration of everything involved in the individual instance.

When the patient reaches the hospital should he be treated in the general ward? Not so, if it can be otherwise ordered. His chances of recovery are not so good as in a private room or in a small ward where there are only two or three other patients. The noise of the ward is objectionable; the light of the ward is also objectionable. Noise is unavoidable here; light can only be subdued by cutting off air in a measure; inhalations cannot be carried out as well and as efficiently. I have tried, and know of what I speak.

So far as other patients are concerned, *pneumonia patients* should be isolated, not because all patients are infective or contagious to others, with proper care and precautions, but a few possibly or probably are, and in time of a prevailing and increasing epidemic influence this should be considered, and more than usual protective care to others should be insisted upon. Of course, I do not wish arbitrarily to ignore the difficulty of doing this, especially if there be numerous pneumonia patients, as has been true during the past winter, and even now. Nevertheless, the indications should not be lost sight of. On the contrary, they should be insisted upon and, as far as possible, carried out.

A word now in regard to the results of treatment in hospitals. Many, many times it is most unsatisfactory. Again, in certain seasons we get a series of cases which do well almost invariably and, really, with very little active treatment of any kind. In fact, a wise expectancy seems to be most judicious and to afford very good, perhaps the best, results. Why, indeed, should we expect good results from hospital treatment, as a rule, and when the cases of pneumonia are of a virulent type? They are brought into the hospital usually at a time when the disease is well advanced (second, third, fourth, or fifth day), sometimes almost moribund, and we begin to give our stimulants or other remedies. Already the patient has had, in addition to an acute and virulent disease, imperfectly and, perhaps, very ignorantly cared for at home for forty-eight hours or more, the *risk* of having gone through all the anxiety, fatigue, exposure, etc., of the transportation to the hospital. Further, we have often to do with poorly nourished and broken-down subjects prior to the attack—subjects, it may be, already of disease of heart or kidneys. Too frequently they are victims of alcoholism or some drug habit. Again they are of all ages, and the very young and those of advanced years are of the number. Given all these conditions, how may we fairly compare results of treatment thus obtained with what we should obtain, with what we do obtain sometimes, many times it may be, in private practice?

There is one other thing to which I wish to direct careful attention in this connection, and one far too often overlooked practically in the treatment or estimate of every virulent disease, and particularly when the poison is very intense in quality, if not in quantity. *The time of the treatment* when begun is most important, essential, and decisive at times in regard to the ultimate outcome of the disease. By doing the right thing at the right time, life may be saved; when there is delay in doing the right thing, life may be lost. The analogy here which I would refer to is the use of antitoxin in toxic diphtheria. Made use of in the beginning in sufficient doses, the patient will probably recover; delayed in its use, or given in too small amount and not repeated, the patient may die. The patient will *surely die* sometimes, even

with the help of a most wonderful remedy. So I believe it to be in a measure with the treatment of acute lobar pneumonia. Put your patient to bed immediately on the advent of serious symptoms of the disease, in a large, sunny, well-ventilated room; provide him immediately with the best nurses and good milk and water; begin immediately antiseptic inhalations, and use all our other curative means sensibly, judiciously, appropriately, and I believe many bad cases may be saved. But delay these primary and efficient, though simple, means too long and the patient will often die. He will die because the poison of the disease has taken hold of him too strongly, in too large quantity, and before proper and suitable means have been employed to check or throttle it.

Now there are some cases of pneumonia, as there are some cases of diphtheria, enteric fever, scarlatina, smallpox, etc., which will almost inevitably die to-day, as always up to the present time, no matter what treatment is employed. And the proof of it lies in the record of medicine for one hundred years or more. Indeed, the virulency of some of these cases is such as to render them wellnigh hopeless, and they will remain so unless medical science gives us curative sera superior to any we now possess. We must also bear in mind here and ever that we shall have occasionally to do with what occurs, both in hospital and private practice, namely, the complications of the primary disease, such as Bright's disease, pericarditis, meningitis. These diseases being present, the case must be managed rationally and in view of everything involved. Despite the best care and treatment, they add much to the gravity of the prognosis, and in some instances they make recovery almost impossible.

One of the most important problems connected with the treatment of pneumonia is the safe and proper use of opium or its alkaloid morphine. In the beginning, when the pain in the side is intense, owing to the complicating pleurisy, it is occasionally indicated to give a hypodermic injection of morphine to allay or arrest suffering. I find little or no objection to the use of the drug in moderate dose at this time, provided the kidneys have not been diseased previously. When the pain is only moderate I prefer local applications as being frequently sufficient to diminish

or stop the pain, and because they are useful, doubtless, in limiting local congestion of the lungs. Later in the disease (and up to the second, third, or fourth day), and despite the judgment of many good observers—notably Dr. Samuel Wilks, of Guy's Hospital, who feels happy only when five grains of Dover's powder are given every four hours in pneumonia—I prefer to abstain from its use, except in the rarest instances. I do not believe the opiate has any good effect upon the march of the pneumonic process. I do believe it is prone to lock up secretions which are already too much interfered with by the disease itself. Professor William T. Gairdner, notably, has directed attention in the grave and advanced forms of pneumonia, to the great and immediate danger resulting from the use of an opiate. To dull the respiratory nervous centre at such time, when nature is striving all she can to protect herself by increased frequency of breathing against inroads of a disease which prevents proper oxygenation of the blood, is to hasten the death of the patient, or at least to diminish his chances of recovery. Dr. S. S. Burt has again directed attention to this subject, and in my judgment very wisely. Of course, distinctions should be made. If the patient be of middle life, with previous evidences of interstitial nephritis upon which a marked acute process is grafted, we *must* do without an opiate.

In more than one instance, I fear, I have hastened death through ignorance in permitting its use. When the kidneys are acting well, with little or no albumin, casts, or blood present, if delirium or insomnia are pronounced and threatening, and if other means have failed to relieve, a small or moderate amount of morphine, hypodermically, is permissible.

Personally, I have never believed in the cold bath, cold pack, or even cold applications locally in the treatment of pneumonia. Occasionally I might permit cold sponging if the fever were very high, but, as a rule, I much prefer the use of tepid or warm water for bathing purposes, to which a moderate proportion of alcohol is added. It seems to me that efforts to diminish fever *per se* in the treatment of pneumonia are scarcely ever a primary and essential object, because I do not believe, as a rule, that the muscular changes produced by increased temperature in its relatively short

duration, although very high at times, can be very pronounced, and I believe the nervous shock caused by the toxin is better allayed with slight or moderate heat than with cold.

For a somewhat analogous reason I am opposed to all large doses of quinine to abate pneumonia or to act as a pronounced antipyretic during the course of pneumonia. On the other hand, I thoroughly believe in moderate doses of quinine when well tolerated by the stomach, as a tonic, as a slight antipyretic, as a blood disinfectant, throughout the course of pneumonia. In large doses, while quinine does diminish temperature, it also decreases heart power and general strength, and therefore is prejudicial to the patient's well-being. Be it added, however, that quinine as an antipyretic for those who wish to follow out this indication formally is far less dangerous in use than antifebrin, antipyrin, or even phenacetin.

I am of the opinion that there is weighty evidence to prove that the solution of ammonia is a preparation, used moderately and continuously in pneumonia, of considerable value. Its value is specially shown not as a stimulant, because in that particular I believe alcohol, as whiskey or brandy, to be more desirable, but to keep the blood alkaline and fluid. In this disease, especially in the grave forms and where there is extensive pulmonary consolidation, it is to my mind a very important matter. I have seen many patients in whom, before death and at the autopsy, I have been convinced that heart clot avoided would possibly or probably have meant a life saved. To no one as much as to Benjamin Ward Richardson is the honor due of great insistence upon this important fact, too much ignored to-day in medical writings and medical practice.

Large doses of digitalis at any period of the disease are, as I believe, prejudicial to the patient, and can never do good. In the milder forms of the disease they are not even indicated from any point of view. In the graver forms and in middle adult life, particularly of most city men, arterial changes counterindicate its use, not to speak of possibly granular degeneration of cardiac muscular fibre. Frequently I have seen the pulse become rapidly very tense and more or less irregular under its use, and the heart

action tumultuous, irregular, and forced, as it were, uselessly and vainly. Minute, continuous doses of digitalis given before there are any symptoms of heart failure may prove useful in warding it off, and when heart failure shows itself not discontinued, but protected as to its action upon peripheral arteries with a moderate amount of nitroglycerin, $\frac{1}{200}$ or $\frac{1}{100}$ grain, given every two or three hours I have found useful, I am confident.

We must bear in mind always that digitalis is not the drug from which we should expect good effects very rapidly in the treatment of pneumonia. Its action, to be useful, must have time as an element, and if given in small doses its cumulative effects, by reason of slow elimination, do not become prejudicial. Apart from other considerations, digitalis in anything but small doses will often cause stomachal intolerance. So soon as there is evidence of pronounced cardiac weakness, digitalis, or, much better, good digitalin and strychnine should be given hypodermically, and not by the mouth. Medication by the mouth in grave conditions in pneumonia is uncertain and unreliable, except for alcohol and possibly nitroglycerin, which do not derange the stomach and hypodermically may cause considerable local irritation.

In regard to strychnine, while I value it highly in the treatment of pneumonia, I am satisfied we have to-day often pushed its use to an extreme degree, and in more than one instance, in which a $\frac{1}{30}$ or even $\frac{1}{20}$ grain had been used hypodermically every two or three hours, I have cried a halt, because I was satisfied insomnia and delirium were being aggravated and the heart action not in reality stimulated by this overdose. I am inclined to believe that my friend Dr. R. G. Curtin has struck a warning note in this connection which the profession will do well to consider and be guided by.

In more than one instance in the treatment of pneumonia, and where other heart stimulants had been of little or no avail, I am sure I have been of use and helped save life with the use of the best available preparation of coca. Given by the mouth or hypodermically, it has often been of service when I had almost given up hope. The reason, I believe, that this agent does not range

frequently respond to our wishes is because the preparation employed is relatively inert. Many coca leaves, not to say the far greater majority, are dry and of poor quality when first gathered. Further, the wrong variety of leaf from which to obtain the tonic alkaloids of the plant is usually employed. Hence much of the coca used as wine or extract contains a large percentage of cocaine, which, I believe, has little or no tonic properties, and does not contain the other derivatives most valuable in cardiac exhaustion of pneumonia. Here is not the time or place to speak further on this topic. It is wisdom to give black coffee frequently in advanced cases of pneumonia with evidences of heart weakness or cardiac degeneration, whenever our coca is unreliable, either by mouth or rectum.

There can be little doubt that saline solution infused by the veins, or by hypodermoclysis, or by the rectum, after a moderate bleeding, has been useful in some instances. I must give a warning note as to using too much saline solution by the veins or too rapidly. I have seen death thus occasioned, as Tyson has also, presumably by dilatation of the right heart.

There is no doubt in my mind that oxygen, given frequently from the time pneumonia shows marked gravity, is extremely beneficial in many instances; but to be of real value it must be given freely and with unstinted hand, and not begun when death is near and already the patient almost moribund. As to a good preparation of oxygen causing notable bronchial irritation, as is sometimes stated, this I have rarely seen, if at all.

There is a point to which I would refer in connection with treatment, because from its appreciation may proceed, I trust, something of real value in prevention of imminent danger. Absence of leukocytosis in acute lobar pneumonia presages death, as hitherto observed. It behooves us, therefore, to have a careful differential blood count made as soon as the disease is at all clearly defined; and no matter how limited locally the disease may be for a while, or how little threatening at first the symptoms, we cannot be too solicitous or too careful in such cases in our care and treatment. Several times death has followed rapidly, in my experience, and, except for the known result of the blood count,

I should have been lulled into a false security. Later, also, we may obtain facts of great value from the differential count of the leukocytes, as we now do in appendicitis. If in the beginning, for example, we discover the polynuclear neutrophiles in relative excess and the eosinophiles notably decreased or absent, may we conclude that these are, in reality, the very serious cases, "whether associated with an increase of the total number of the leukocytes beyond the normal or not?" I must leave a positive answer, for the while, with my laboratory friends.

I am of the opinion that, except in the beginning of a pneumonia and in specially rugged or full-blooded patients, venesection is not desirable, as a rule. To this there is one exception. In the first two or three days of the attack of acute lobar pneumonia, where general œdema of the relatively healthy lung occurs, I have known life to be saved more than once by a prompt and sufficient venesection (eight to twelve ounces as a mean). Later in the disease, while at times it might be indicated and performed, the result would rarely prove beneficial for more than a very brief period. I grant only two exceptions at an advanced stage. One is where the right heart is distended and unable to cope with its fluid contents, and, despite all judicious cardiac stimulation, the use of nitroglycerin, oxygen, etc.

In these instances I have seen temporary good effects produced by a venesection, and occasionally, perhaps, a life saved. The distention of right heart and jugulars, with great breathlessness, pallor or almost lividity of lips, face, extremities, and even portions of the trunk, means beginning thrombosis, and reducing the bulk of blood will not save life unless we dilute it and, incidentally, perhaps, partially neutralize its contained toxins. Give, therefore, a moderate saline infusion after the venesection, with this hope, and also insist upon beginning immediately or continuing frequently the use of ammonia under form of the strong solution or the aromatic spirits.

The other condition in which venesection may be and is occasionally useful is where the patient is suffering unquestionably and mainly from profound general toxæmia. It is then an indifferent matter, relatively, whether the pneumonia be in its initial stage

or fully developed. In the latter stage of the disease, as in the former, I should usually consider it indicated to make a moderate infusion of saline solution by the veins, or give the solution by hypodermoclysis, or by repeated enemas or irrigations, to dilute the poisons remaining in the blood. I insist, however, that the quantity of the venous infusion in these and all instances should be moderate and the infusion slowly made. Otherwise the benefit derived from the venesection will be rapidly neutralized, and the patient's immediate condition rendered even worse than prior to the active interference. In one case that comes vividly to mind I felt satisfied that the excessive and too rapid infusion certainly hastened the fatal termination of the case. After the venesection the patient showed signs of returning consciousness, although just before in active delirium, and the pulse was decidedly stronger. A little later, after the venous saline infusion, unconsciousness returned, and the pulse lost strength perceptibly and rapidly until death supervened.

There are good reasons at present to support my contention, particularly in pneumonia. In this disease there is a notable retention of chlorides; hence we should not add much to these, especially where there is doubt as to the condition of the kidneys. If there be marked epithelial changes in these organs, which, as we know, not infrequently exist in severe cases of lobar pneumonia, rapid œdema of the lungs may be effected, which shall prove to be the immediate cause of death, or of an œdema of the meninges or other serous membrane, which may cause a rapidly fatal termination of the case.

The quantity of water may do harm. Whenever saline infusion is followed by marked diuresis we are apt to obtain good effects. But in other instances we find the contrary prevails, and certain accidents occur. Some of these, due to a further retention of chlorides, I have already referred to. But we may have others occasioned specially by the amount of the fluid itself, which are dilatation of the right heart, followed by cardiac failure, vascular distention in the lungs and, as a result, great dyspnœa, accompanied or not by pulmonary œdema and uræmic symptoms of imminently grave import, the explanation of which

is probably multiple. Suffice it to add that saline infusions, moderate in quantity and slowly made, are cardinal indications, in my judgment, at present, whenever this treatment is seemingly called for in the treatment of lobar pneumonia.

It may be that in certain instances it would be well even to substitute the sulphate infusion for the chloride, in view of the injurious known results of the latter at times, and although the quantity infused is moderate. This problem is still *sub judice.*

No doubt in the beginning of the attack of acute lobar pneumonia it is useful to prescribe a few grains of calomel to free the intestinal tract, thus lessening local congestion of the lungs and eliminating a certain amount of toxins. Aside from this, it is claimed that a dose of calomel, if sufficiently large and employed properly, may act as a local disinfectant of mouth and throat (Musser), and later, in like manner, in stomach and bowels. At an advanced stage of the disease we all know what extreme gravity is connected with great distention of the bowels, whether it acts mechanically by pressure upon heart and lungs, and thus prevents their functions being exercised, or by reason of great absorption of toxins from the bowels, increasing notably this source of peril to the patient. In either event, we have often a paralytic condition which aids further distention, and is only too evident and threatening. When this condition occurs we should first of all empty the bowels by a proper dose of some mercurial, preferably calomel, or gray powder, or a saline aperient, and afterward give a pint or two of normal hot saline solution as an injection, which may be repeated twice or more times in twenty-four hours. Not only is much decomposing and poisonous excretà thus carried off, but, in addition, through absorption, the toxins in the blood are diluted and rendered more bearable by the patient, and at the same time the heart action is strengthened and the renal secretion rendered more active.

By some we know the kidneys are considered the most powerful emunctory of the economy in acute lobar pneumonia, and whenever the urine diminishes notably in amount, and there is great decrease in contained chlorides, the indication is to awaken their action and proper secretion as speedily as possible. Saline

irrigations or injections, administration of salt in the food, supplies, as far as may be, at times two formal objects of treatment. When these fail we may give, by the mouth in proper form and dose, some intestinal antiseptic drug like beta-naphthol, the salts of bismuth, creosote, charcoal, or a mineral acid, and obtain a good result. Upon such medication in like case, I confess I place but small reliance, in view of the evidence in all organs and functions of the intense and very grave toxæmia of the pneumonic infection.

A final word in regard to the use of alcohol in pneumonia. To my mind there can be little doubt that acute lobar pneumonia is one disease, at least, in which the use of alcohol is almost imperative at times, if we wish to tide the patient over an imminent crisis. The frequency and amounts given at such times are governed almost solely by the urgency of the case and the apparent benefit derived. Under other conditions, especially with those unaccustomed to the use of alcohol when well, the amount given may be small or *nil*. With alcoholic subjects, of course, alcohol must be allowed freely, even though the disease may not be far advanced nor very threatening, except from our previous knowledge of how much such cases are always grave. As a matter of great practical importance, I would insist that the whiskey, brandy, or champagne which is taken by the patient should be the best or purest procurable. I am sure many cases of nausea or more pronounced stomachal intolerance, particularly in hospital treatment, are caused by cheap and bad spirits given to the patients. Can anything be worse than such symptoms at a time when the circulation needs all available extra stimulation? And is it not deplorable to think that these are caused or aggravated frequently by meanness or ignorance, which permits or upholds the purchase of liquors for the treatment of the ill of a very inferior grade, and which, in my opinion, are often injurious rather than beneficial?

In the treatment of no disease are frequently repeated visits from the physician, supported from the beginning with good nursing, more important than in that of pneumonia. In no disease, therefore, is free and unstinted expenditure of money

more serviceable. Attention to these requirements will be the means of saving many lives which otherwise would surely be lost.

In conclusion, I wish again to emphasize what I regard as essential propositions. These are :

1. To begin judicious, rational treatment immediately, and to continue it during the attack.

2. The most useful *single agent* in treatment, as preventive and curative, is creosote, used preferably as inhalations, properly given and continued for a sufficient length of time.

3. Strict avoidance of extremes of treatment in any direction, whether it be toward the use of so-called specifics or the employment of certain drugs, notably digitalis and strychnine.

4. It should be graven on our minds that pneumonia may be throttled or minimized most surely in the beginning. Later, when the disease is fully developed, our role is inferior, but should consist mainly in doing least harm.

5. Harm proceeds almost invariably from ignorance or undue enthusiasm.

DISCUSSION ON PAPERS OF DRS. HOWARD S. ANDERS, J. M. ANDERS, AND BEVERLEY ROBINSON.

Dr. Rochester: I was very much interested in Dr. Howard S. Anders' paper as presented, and I think it is a very valuable addition to our literature in the number of normal cases that he reports as having been observed and recorded. No doubt it will go into permanent literature on that account, and his observations on the change in pitch in the case of pneumonia particularly (and that is what I would confine my remarks to) are of great value. In my own observation in cases of pneumonia I have paid attention, as other observers have, to the intensity of the sound—to the changes in the intensity of the sound and likewise to the duration of the sound; and I find that shortening of the duration of the pulmonary sound is indicative, just as the raising of pitch is, of beginning failure of the right heart; and, of course, we know that with elevated pitch the note is usually shorter in duration, and the two go together very well. I think that it is a very valuable addition to our knowledge in cases of diseases of the respiratory tracts.

In regard to Dr. Robinson's paper, it is pretty difficult to take it up point by point, because it covers such a very large area of material. In regard to the prevention of pneumonia by inhalation, that, of course, is a matter very difficult, as he says, to prove, and I should be very skeptical as to the value of overloading the air with a drug like creosote; and what we really need in cases of pneumonia is the purest air we can possibly get to them and in the largest quantity possible, and when we cannot get it in sufficient amount we should use oxygen instead of pure air. In all cases of pneumonia, in my opinion, there is more or less involvement of the kidney, and that is shown, I think, by a thorough and careful observation of the twenty-four-hour sample of urine in the first place—the whole quantity. In the next place different samples at different times of the day, and if thus examined you will invariably find a minute amount, or in some cases a large amount, of albumin present in pneumonia; and I believe the kidney is almost as seriously involved in severe cases of pneumonia as the lung itself. It is a very serious matter to administer constant inhalations of creosote, lest we have marked disturbances of the kidney from that drug.

Furthermore, in regard to the care of the sputum in the prevention of pneumonia, I think it should be cared for, and I most heartily indorse the use of mouth-washes. Not only do I insist upon mouth-washes, but upon the nurse scraping off the tongue and swabbing out the mouth around the teeth as well, and that, I think, is of very great importance. But, regarding the use of carbolic acid and corrosive sublimate in the cups beside the bed, I think it is absolutely valueless. I made some experiments bearing on this in cases of tuberculosis several years ago, in which the sputum was deposited in corrosive sublimate, 1:1000 solution, which simply coagulated the material around the outside, and, even though I left it twelve hours in this solution, showed active tubercle bacilli in the centre in the case of sputum deposited in such a solution; so that unless you stir your solution up very thoroughly and very frequently (which you will not do) you will not get that sputum thoroughly disinfected by carbolic acid or corrosive sublimate.

Another thing: in this matter of disinfectant solution there is danger, and patients have been poisoned from drinking in their delirium corrosive sublimate solution. That has occurred to my positive knowledge in two cases where patients have been poisoned from drinking from their sputum cups with corrosive sublimate in them. I will hurry over this matter and simply refer to two other points which are particularly interesting to me in the treatment of pneumonia. If we watch pneumonia carefully and see how the patients recover therefrom, we learn that they recover by sweating. It seems to me the plain indication for us is to follow nature's suggestion and just get rid of toxæmia through the skin. It can be gotten rid of, namely, by profuse

sweating that can be induced without drugs; therefore, I sweat all my patients with hot air, usually administered by means of the hot mustard foot-bath. I have recently sent to all members of the Climatological Association a reprint in which I reported 210 cases of pneumonia treated after this manner. Including all cases, that is, old cases (and one was eighty-two and another eighty-nine years old), cases that were alcoholic, cases that came under observation just a day or two before death, cases with empyema and other complications—with all these cases included there were twenty-three deaths—a little over 11 per cent.—that is, in all classes of cases. If I were to exclude the cases which Osler said should be excluded, my death rate is reduced to 2½ per cent. Of course, we have not a right to exclude those cases, but I think sweating is the most important procedure in the treatment of pneumonia, and next to sweating is the local treatment of the lung and heart, which consists of cupping vigorously over the lung. I can relieve pain better by dry cupping than by hypodermic injection of morphine. A physician whom I was called out to see in the country a short time ago was suffering severely from pains in his chest. He had had morphine in quarter-grain to half-grain dose given to him hypodermically at three-hour intervals. I said, "Stop your morphine," with only momentary relief. We cupped his chest, using tumblers for cups, and it relieved him immediately. He said, "That is the first relief I have had." To dry cup properly you have got to put on a big enough cup which shall bring the skin and the underlying flesh half-way up and will turn purple and blue. If you are going to cup you want to cup vigorously, then you get your results. In regard to bleeding in pneumonia, I find it of very great importance and very great value in properly selected cases. I would not care to say to bleed all cases, and I do not believe in bleeding them right at the start. We do not get the results that we are after. The time to bleed with good results is when the right heart is distended and the circulation failing therefrom. We get just as good results by sweating and purging by the use of calomel and salts. I have seen case after case where distention of the right heart was relieved by the withdrawal of blood. You have got to draw a pint or more blood to have any effect. Just this last spring a lad, aged seventeen or eighteen years, had a very severe case of pneumonia involving one part after another, and all the lobes of both lungs were finally involved. At one period of his disease his respirations were 56, his pulse 130, and his temperature 105°; he was purple; the veins in his neck were pulsating; you could hear the heart sounds distinctly over his liver, and his liver was getting down toward the umbilicus. We bled 800 c.c. of blood at one bleeding, and his respirations dropped from 56 to 36; his pulse became regular and dropped to 112, and his temperature dropped five points and the boy was comfortable. Of course, his temperature went up again, and his respirations increased to about 40

again, but he went on and finally recovered. This boy had a pericarditis besides, which, I think, was entirely cut short by proper local applications of leeches.

Dr. Curtin: Dr. Klebs has spoken about the mortality in pneumonia, past and present. A Philadelphia physician recently gathered the statistics from the Pennsylvania Hospital for two hundred years in quarterly tables, and he found that the mortality was only fractionally different in those two hundred years. We think we know how to treat pneumonia successfully, but from this report it would seem as if the results are now about the same as they were in the distant and much reviled past.

I regard Dr. Robinson's paper as very sensible, and it has pleased me very much. I was glad to hear him speak on the different subjects that he has brought forward in so clear a manner. There is one topic that I would like to speak about, which was mentioned by Dr. A. H. Smith, of New York, in a paper published some years ago. In this paper he states that the first indication that the heart is acting under a strain is shown by an accentuation of the pulmonic second sound. The pulmonary valves shut down suddenly owing to an obstruction in the circulation, which results in an imperfect opening and closing of the leaflets. This early physical sign demands prompt action. If you unload the left heart upon the right you will increase the congestion; therefore, digitalis is contraindicated. I think that in treating pneumonia we often overfeed. The bulk of the blood is thereby increased, and the lungs still further engorged.

In regard to Dr. Robinson's remarks concerning bleeding, I think this increases the tendency to thrombosis, if used late in the disease. If used at all it should be early and in plethoric cases. Regarding the increase of pneumonia among those well housed, perhaps the sudden changes in going from closed, warm buildings into the open air, and then going from the open air again into closed apartments, are provocative of congestion, which favors the production of pneumonia. Again, the warmth of dwellings probably makes the persons less resistant when exposed.

I agree with Dr. Robinson in regard to strychnine. I have been called into consultation for five cases of pneumonia in which persons have been markedly poisoned through overdosing with strychnine. This drug certainly does do harm when given in too large doses, and it is used too freely at the present time. In one of these cases there was spasm of the diaphragm, and the patient died very suddenly; and I do not think there is any doubt that he died of the effects of an overdose of strychnine.

Dr. Bonney: With reference to Dr. James Anders' paper I did not hear him say anything concerning the influence of altitude upon pneumonia. Perhaps it would not be out of place to mention very briefly the clinical expe-

rience of men living in Colorado. I remember that when I went from Asheville to Boston to see Dr. Shattuck to seek advice with reference to going to Colorado, he said this to me: "Pneumonia is very prevalent in Denver, and alarmingly fatal, and if you get pneumonia get on to a car as quickly as possible and get down out of that altitude." Now, the facts are that pneumonia in Denver at an altitude of 5000 feet is not nearly as prevalent as it is in many of the Eastern cities; and, secondly, the mortality is very decidedly less than in any of the large cities that I am familiar with—New York or Chicago—but if the people at an altitude of 10,000 feet in Cripple Creek or Leadville are afflicted with pneumonia, the death rate is alarmingly high; and it is almost the same as a funeral for a person to have pneumonia at that altitude, showing that there is a point between 5000 and 10,000 feet where the balance is turned in the other direction to the detriment of the patient.

It has been my experience in Denver that patients have convalesced very much quicker from pneumonia than what I have been led to believe has been the case at sea-level. My opportunities for observation at sea-level were so limited that perhaps it would be impossible for me to draw a fair comparative deduction; but from what I hear, from what I have read, and what little I saw in New England, I am assured that resolution takes place far quicker, the convalescence is far more satisfactory, at that altitude.

Now, with reference to the treatment of pneumonia, I feel that we cannot pay too much attention to the environment and surrounding—the immediate surrounding of the patient in the first day or two of the sickness. I frequently see in Denver gentlemen taking care of pneumonia who are giving the right treatment. Perhaps they have used the dry cups the first day to just relieve pain; they may have given a Dover's powder; they may have given the acetate of ammonia for its sweating influence, and the bowels have been thoroughly moved with calomel; and as far as the medicinal treatment pursued is concerned it leaves little to criticise; and yet you find the patient in a closed room with the windows closed, too many bedclothes—perhaps the patient up in close proximity to a furnace. Recently I was called in consultation. I could criticise nothing in the treatment; every window was closed; the bed was very close to a large stove which was to heat two or three rooms, and the patient was covered with all kinds of bedclothing. Besides a sheet, a blanket, and feathers and spreads and quilts there was a spread acting just like a rubber blanket and the patient was sweating; and, after all that, I feel we should criticise personally; I do not approve of a hot-air bath in pneumonia at all stages in the case. I feel that we should consider as much as anything, or one of the things that we should consider, is the heart; and I should have to take issue with the indiscriminate sweating by means of the hot air. I think such sweating as might be induced by judicious use of the *liquor ammonii*

acetatis is good. I approve of the calomel to keep the bowels good from beginning to end; keeping the room temperature comfortable; good fresh air is of infinitely more importance than oxygen. I feel that oxygen is capable of saving life. I am confident I saved life with it at the crucial time—at the time of the crisis.

Dr. Phillips: With reference to James M. Anders' paper, there seemed to me two things Dr. Anders did not touch upon. He spoke of the prevalence of pneumonia, its greater incidence during the cold season of the year, which is a well-known fact in temperate climates. It has no seasonal preference in tropical climates. There is no doubt of the effect of something in temperate climates bringing about its seasonal incidence. What that something is is very interesting. The meteorological element that coincides most in its movements—in its ups and downs—with the ups and downs of pneumonic deaths is the temperature. It is impossible, I may say absolutely impossible, at present to express the pneumonic death rate in temperate climates as a function of the temperature; yet I think that a low temperature has a decided effect and in a manner that has not been brought out by Dr. Anders. An exposure for a short time to a low temperature does produce in the human body a fall in the temperature of the human body itself. That I know from a series of experiments upon this subject that I conducted some six years ago and reported in the *Monthly Weather Review*.

Let any of you gentlemen that wish to try go out from an ordinarily comfortable room to, we will say, a temperature of 32°, or lower, for a couple of hours and then come back. If you have taken the precaution to take your body temperature before going out, while out, and after coming back you will notice two things: you will notice that your temperature falls gradually for some time before equilibrium is reached, and when you return to the house you will find it will be from a half to three-quarters or even three hours before your temperature gets back to the point it was before going out. That is a physiological effect that the temperature does have upon the organism. In my experiments the temperature was taken in the mouth, taken under the tongue, and carefully taken. The temperature falls, dependent upon the clothing. I have taken at the same time the temperature between all layers of the clothing. On first going out, after five or ten minutes, all the heat of clothes arising from the interior house temperature is usually lost; from then on the thermometer placed immediately next the skin begins to show a decline. I have staid out in my own person until I got so chilled I could not stand it any longer, and the skin temperature was getting lower and lower and lower. It would be interesting to know how long a man could stay out.

Another thing: the effect of humidity. Dr. Anders mentioned the relative humidity; but relative humidity does not mean anything of itself, and I wish

our climatologists could get that into their heads; that relative humidity is merely a convenient term for expressing the relation between two absolute things: temperature on the one hand, and absolute humidity on the other; and when you say the relative humidity is so and so, unless you state the temperature you have not stated anything that is tangible. The absolute humidity in cold weather is low, decidedly low; at the same time the relative humidity may vary anywhere between 100 per cent. and almost 300 per cent. Dr. Henry B. Baker years ago suggested the possibility that this lower absolute humidity in winter weather was a causative factor of bronchitis and pneumonia. Low absolute humidity means an increased evaporation from the mucous membrane of the mouth, nares, and trachea. The mucous membrane of the respiratory tract is, so to speak, overworked, and has a tendency to be dry because of the excessive evaporation of water from its surface. May it not be that during cold weather the excessive evaporation from the mucous membrane and nasopharynx may place that mucous membrane in a condition susceptible, much more susceptible, to permit the passage through it of infection? We know pretty well that the pneumococcus can be found in healthy throats. A great many of us are carrying it around just simply awaiting an opportunity to get in its work.

Dr. H. Longstreet Taylor: I know I show a great deal of temerity to get up here and say anything against the conclusions of President Phillips, because whenever we talk anything about climatology he always tells us we do not know anything anyway; but I come from a cold part of the country, and I do not agree with him that we have most of our pneumonia cases with the temperature at its lowest point. We have snow on the ground from November to April, practically every year, and it is not in January and February that we have the most pneumonia, but we have a great deal of it when the snow falls and again when it thaws. This winter we passed through a term of ten days when the thermometer did not reach zero at the warmest time of day. Those were the hardest days practically of the winter, and during all that time my pulmonary cases, tubercular, were sitting out-of-doors and objected to going into the house.

Dr. Elliott: Our climate in Muskoka is perhaps very similar to that in Minnesota and the Adirondacks. My experience has been much the same as Dr. Taylor's, that the incidence of pneumonia is not more marked in winter; and in the winter our actual humidity is very, very low, the average actual humidity through the winter being, I believe, much less than one grain of moisture per cubic foot; so that the condition of very low actual humidity cannot be a very important factor in it.

One other thing: in reference to what Dr. Phillips has said regarding the temperature of the body dropping very markedly in cold weather and those

observations taken of the temperature in the mouth. In carrying out the out-of-door treatment of tuberculosis in very low temperature, I find that the temperature taken by the mouth does not correspond with the temperature taken by the rectum; that in a patient sitting out-of-doors or even sleeping in a cold room you may find a subnormal temperature of 94° or 95° in the morning when the mouth has been closed for twenty minutes; then the temperature is taken, and with a reliable thermometer remaining in the mouth for three to five minutes; that the rectal temperature may be within a degree of normal when the mouth temperature is down to 94° or 95°, and that the rectal temperature does not fluctuate with the out-of-door cold as does the mouth temperature.

Dr. Minor: I feel it is dangerous teaching to advise a hot pack or hot-air baths in pneumonia, though we have all used them in other conditions with great benefit. There are few things I trust in more in certain kidney conditions; but certainly the effect, as I have always observed it, has been so depressing that I could hardly think it wise to use a procedure of that sort. As regards the point that Dr. Elliott has just referred to, I should simply say that while fully agreeing with him I am satisfied that out-door temperatures in winter, for those following out-of-door life, should be taken at least ten minutes in the mouth. When you push the mouth time up to ten minutes you will find you will more closely approximate the mouth to the rectal temperature. Less than five minutes is no use at all, and in cold winter days, such as we have at Asheville and much more at Muskoka, the out-door temperatures must be taken at least ten minutes.

Dr. Quimby: I was much interested in Dr. Anders' paper on the pitch of the pulmonic sound, as I have been studying the pitch in thoracic sounds for the past ten or twelve years, and I would be very glad if the doctor will tell me the title of the work where I can find the law that increase of intensity tends to lower the pitch.

Dr. Howard S. Anders: I beg your pardon. I said "increase of tension." The greater the tension, the higher the pitch.

Dr. Quimby: I understand. Then I will not enter into a question of physics at this time.

I understood him to say that the louder the sound the lower the pitch. That implies, then, that increase of intensity tends to lower pitch. There is something wrong in Denmark when men who are seeing as much of pneumonia as we are and men who are conscientious and good observers disagree so radically in reference to such a measure as that of sweating. It seems to me that it is possible to harmonize differences a little in this way: pneumonia is an infectious disease; there is a toxic development; it has a limited period, a fixed course; in other words, the system eliminates that toxin. The system

does not go at the work of elimination immediately, apparently, but forms something which we call antitoxin; in other words, before the toxin can be eliminated certain processes must precede. The patient goes through his pneumonia, in which he does not sweat until toward the end, and in my own experience those patients who sweat early in the disease have a hard time of it.

If Dr. Rochester means that toward the proper time for a climax it is proper to sweat a patient, I think most of us will agree with him, and that the other gentlemen will recognize that efforts to produce sweating at that time are exceedingly satisfactory; but that the production of sweating early means always reduction of arterial tension, and arterial tension is a factor, as Dr. Anders has shown, in the processes of defence.

Dr. Klebs: When I take the stand here and speak to you it is because the facts which have been noted here about lobar pneumonia seem so radically different as coming from different observers. There does not seem to be one single point on which everyone is agreed. When those with large experience seem to have such different views, this is for the younger men especially bewildering. To begin with: it was mentioned here as an indisputable fact that lobar pneumonia is an extremely fatal and most prevalent disease. I have made some statistical investigations on that subject. I showed you some charts yesterday, and as far as lobar pneumonia is concerned, that it does not seem to be borne out by statistics; that the disease is enormously prevalent, and more prevalent than it used to be. We have an increase from what is called pneumonia, but not from lobar pneumonia. I showed you yesterday the tremendous increase which so-called pneumonia has brought about in ages under five years in children. That cannot be lobar pneumonia; that must be bronchopneumonia to the greatest extent. Holt gives the proportion of bronchopneumonia to lobar pneumonia in childhood at 75 to 25; so that for the increase of pneumonia in childhood, which, of course, materially affects the total increase, lobar pneumonia cannot be made responsible. This seems not to be taken into account sufficiently, and there is a sort of panic which has set in among the profession as well as among the laity in speaking of pneumonia. It was expressed in all of the papers read as far as I remember. It may be well that we remember a paper which was read before this Association some years ago by Drs. Townsend and Coolidge, which was perhaps the best expression of the subject that was ever brought before us. They analyzed 1000 cases treated in a series of years at the Massachusetts General Hospital. That observation brought out the fact that the mortality had been practically the same through all these years, and absolutely uninfluenced by various factors: that there was increase in the mortality because there were cases sent to the hospital of more advanced age; but taking the age element and others

into consideration the mortality was not great. We have various observations from a great many hospitals. I collected several statistics from hospitals, and the average mortality from pneumonia in these hospitals hardly exceeded 20 per cent. It frequently was lower. This does not speak for a great fatality, especially since we have recognized the fact that the worst cases are sent to the hospital. In military hospitals, in private practice, the mortality among adults is considerably lower than in these hospitals.

As to the treatment, it is also shown in Townsend and Coolidge's work that during these different periods of years various methods of treatment were used. In the first period there was heroic treatment—profuse bleeding, dry cupping, etc. In the intermediate period there was some letting down from these measures, and more medicinal methods were used. In the last period a rather expectant treatment, probably induced by the effect of the example of the Skoda school, and cases were treated expectantly. Absolutely and radically different methods of treatment were used and the mortality still remains the same. I think that is something we ought to take into consideration.

Dr. Howard S. Anders: I am greatly appreciative of the interest taken in the whole discussion on pneumonia, and I am very glad, also, to acknowledge my gratitude for the kindly reference made to my own paper.

First, in regard to this matter Dr. Quimby brought up of the physics involved in the accentuation of the second sound, I tried to make clear in my paper that there was not any contradiction here when I there said, speaking of anything that will stimulate an hypertrophy of the right ventricle by increasing the resistance to the flow of blood through the lungs, causing accentuation of the sound of the pulmonary valve (reads from manuscript, part 1, seventh paragraph).

Now, the laws of physics are laws; they are not opinions or matters of individual judgment, they are hard and fast; they are almost mathematical in their certainty. If they were not, they would not be laws, and those two laws do hold. The lower the pitch the louder the sound, for the simple reason that you can hear a bass-drum farther than you can a kettle-drum. So is a deep-toned whistle, like Baldwin's Locomotive Works whistle, heard farther off than the higher-toned, piping whistle of the little factory in the neighborhood. So here the law governing the cause of the elevation of pitch supervenes over that of the cause of a lower pitch; of tension over mere accentuation of loudness of sound. Just as I hold this paper in my hand, I am influencing it by muscular power, by my will. The law of gravitation would make that paper fall to the floor; the law of gravitation is prevailing just as much now while I hold that paper in my hand as when I let that paper fall to the ground; but my will—the psychical law of my will—supervenes and oversteps the law of gravi-

tation for the time being. As soon as I am willing to let the law of gravitation supervene, then it falls; so in this case, the law of pitch supervenes over that concerning greater intensity.

Now, with regard to the question of meteorology, I am very sorry my senior kinsman is not here so that I could thank him for making this reference in his paper to my work. Just as I have found in connection with influenza (and influenza and pneumonia are so closely related in their incidence that we should expect *a priori* that the conditions should be alike meteorologically) so he has found in pneumonia. I simply wish to emphasize the importance of the fact that daily observations—daily observations day by day for groups of two or three days a week in the course of a few weeks—are worth more than maxima or minima taken over longer periods of time, such as months or years. The absolute daily range, and the conditions under which we live day by day that make us more susceptible or more resistant, as the case may be—these differences operate more than do the average of long periods taken together.

With regard to the treatment, Dr. Beverley Robinson has no doubt treated ten times as many cases of pneumonia as I have, and yet perhaps I am one of the heterodox younger generation; not a therapeutic nihilist, nevertheless one somewhat skeptical as to the value of drugs in the treatment of pneumonia. The cases of pneumonia that I have treated in private and in hospital practice always do better when I give them the least amount of medication of any kind, and so with regard to alcohol. I think that overfeeding, too, is another adverse thing in connection with the treatment of pneumonia. I think that when you give them meat extracts and concentrated meat broths, you feed the disease and do not help the patient. I think that most cases get well in spite of alcohol when given, and do better without it.

I feel that when I was giving alcohol in the case of pneumonia I was adding poison to poison already present. Although I have not used the method Dr. Rochester has spoken of—of hot air—I think that we have a strong hint in nature when we see cases of pneumonia very ill, with their skins attempting to force out toxins with the sweat. We have an important hint there to take advantage of and to encourage sweating by whatever means.

Dr. Rochester: It has been said that we should not sweat our patients because pneumonia does not sweat them until the end. It is not to get rid of the toxin of pneumonia that we sweat our patients. Our patient is poisoned by the retained toxin in the body as well as by the toxin of pneumonia; and the body is not excreting as it should; its kidney is not doing its work as it should; its bowel is not doing its work as it should, and its skin is not doing any work at all. It has a dry, hot skin until the time of crisis occurs. If we can relieve sufficient of the poison accumulating in the body; if we can get rid of the accumulated chlorides possibly doing some harm that the kidney is not

getting rid of; if we can get rid of those poisons by the institution of sweating we are helping the patient toward recovery, and we relieve that toxæmia of the individual. We get that result not by giving drugs, but by the production of sweat by hot air, and I think we can get the very best results in that manner. In reply to what Dr. Robinson has said, I can refer you to the statistics of a large number of cases in both private and hospital practice, which give 10 per cent. better results than other tabulated cases. Moreover, in Dr. James Anders' paper there is one thing to which I want to call your attention, viz., that those months in which there is the least pneumonia are the very months in which people sweat the most.

RESPIRATORY EDUCATION IN THE TREATMENT OF LUNG AND HEART DISORDERS.

By J. MADISON TAYLOR, M D.,
PHILADELPHIA.

This communication is offered as a plea for the wider use of educational development of the function of respiration, and is based upon experience in cases where other customary measures had signally failed. Much has been written and said by those who recognize and use respiratory exercises as an auxiliary to measures which are called scientific, but the subject is capable of much amplification and practical adaptation.

The scientific possibilities of developing the function of respiration are both large and useful, provided they be pursued by those who appreciate reasoning from physiology, and are equipped with a practical familiarity with and appreciation of the principles of physical education. It is safe to assert that few physicians fulfil these requirements, especially the latter.

The ground for making this statement is a personal investigation of many years. The counter assertion arises of an over enthusiasm exaggerating the value of physical economics. The reply to this is that of all therapeutic fashions that have come and gone not many can compare in primordial reasonableness to the employment of scientific researches as to the best means of economizing and enhancing the bodily forces through education and development. Few persons have well developed lungs when young, and fewer in middle age.

It is true we shall have more and better knowledge as the study proceeds, but our purpose here is to call attention to the principles by which action can even now be taken to the great advantage of patients; if compared with the exploiting of convictions which

the physician may cherish as to the healing properties of favorite drugs, the decision would seem to be decidedly in favor of functional development. Why have so few recognized the value of functional education or the potentialities of systematic organic development?

The most obvious reason is the lack of co-operation between the physiologist and clinician, who until recently have drifted much apart, and only slowly now are the currents setting together.

The next reason is the indolence or ignorance of medical men in the personal application of mechanical remedial measures. The word of counsel, the directions for use of drugs or differentiations in diet, climate, and the like are assumed to suffice for most needs, whereas the demonstration of how to amplify thoracic competence involves some labor.

Hence if developmental measures are used at all, their application is usually delegated to others. Most of all, however, that which impairs confidence in special movements and manipulations is the fact that such large, shallow, and unsupported claims are made as to their efficiency by those who are neither educated in the natural history of disease nor held in check by those ethical bonds which so completely influence the conscientious physician. Nevertheless many of these claims are probably in essence justifiable. Now that so widespread a popularity is accorded to bodily cultivation, every newspaper and popular magazine teems with articles on physical culture, it behooves the profession to sift this empirical evidence.

We have always learned most from the marshalling of empirical facts moving along scientific lines and growing by natural selection.

The time has come for the profession to give the same thought and study to physical economics, the training of the body, the husbanding and developing of its resources as it has been giving to studies in pharmacology in its search for disease preventing and correcting measures.

In the two great departments of organic damage, diseases of lungs and of the heart, the value of rest has long been deemed paramount. Any attempt to use activities, voluntary or passive,

have been viewed as perilous. The reason for this is that regulated activities and physical training are apt to be considered only from the standpoint of muscle building, which is only rarely of value and with which this communication has nothing to do. Again, physical training has been left almost altogether in the hands of those without medical education or experience. When physicians realize the possibilities for their patients which lie in the education of the machinery of respiration and circulation, and make careful clinical experiments in tissue reorganization and readjustments through these agents, we may expect great advancements in the restoration of functional competence. Already there has been much good work done in these lines by certain medical authorities, and for many years. Assuredly it is not possible for anyone to judge of, nor to test, the efficacy of breathing exercies or stretching movements at second hand. To submit a patient entirely to the tender mercies of an uneducated physical trainer or masseur and expect to get uniform or definite results would be no wiser than to send him to a reputable druggist and encourage the selection from his stock of such remedies as in his judgment would meet the needs of the case.

It has been my good fortune to see admirable results follow manipulative treatment, breathing exercises, passive stretchings, and carefully directed active movements at the hands of others. This was often among patients who had failed to improve in the hands of good physicians previously consulted. The element of suggestion may be ignored. It is only permitted to speak now directly of my own experience. This has been sufficient to strengthen the conviction that better results will increasingly follow these measures, provided physicians can be induced to become reasonably expert themselves. It is not contemplated here to offer details; that may come later. Nor is it expected that unsupported assertions or claims will be accepted as to the character or quality of the results obtained. The proofs will be supplied on another occasion. Curiously enough conclusions are not considered tenable unless case histories are presented in conventional fashion, with a due marshalling of temperature and respiration charts, sphygmograms, blood counts,

uranalyses, and the like, which are supposed to add to the veracity of the narrative. Nevertheless, it is possible now to refer to the character of the cases treated, to describe in outline the kind of treatment employed, and finally to emphasize the principles on which alone the best results can be expected.

The material from which my inferences have been drawn consists in great part of neurasthenic folk exhibiting derangements of the respiratory and circulatory organs. Some of them showed advanced tuberculous disease of the lungs, many grave susceptibilities pointing toward phthisis, also evidences of old pneumonia, chronic bronchitis, pleural adhesions, atelectasis, and the like. Certain others displayed definite cardiac disease with the customary array of sequent disabilities. In a large number there were various disorders of circulation, vasomotor ataxia, erythromelalgia, œdema, tachycardia, dyspnœa, exophthalmic goitre, evidences of advanced arteriosclerosis, senile myocardias, etc. A great number of children, among whom my experience has chiefly lain, have been studied. They are most difficult to teach, but the results have been practically satisfactory. Among the most gratifying subjects can be cited many physicians and medical students, male and female.

In search of specific remedies we have neglected one of the most efficient means of cure. By means of medicine, drugs, serums, electricity, rays, and the like we can hope to accomplish certain results of enormous importance, provided we measure possibilities by brilliant promises. No account, however, is usually taken of fortifying the body through developing its latent powers from the standpoint at which they are found, or of recovering tissue elasticity.

This is the prerogative and field of respiratory education and whatever else tends toward disciplining and conserving the inherent powers of the organism, however large or small those of the individual may be. This is the broad basis on which the present recommendations are made.

It can be objected that in respect to the disorders of the lungs and heart the lesions may be so advanced that to encourage any voluntary effort involves some peril to degenerated structures. In some extreme instances this demurrer obtains; but, on the

other hand, it may be urged that as to drugs we know little enough of their primary or secondary action, and almost nothing of their ultimate effects on remote tissues, especially on damaged or devitalized cells. Certain drugs produce often most happy and powerful effects, such as phosphorus, strychnine, arsenic, iodine, mercury, and the like. Certain of the secretions of the ductless glands promise more; hence some of us turn to the product of these glands taken from animals, and from them marvellous benefit has occasionally come. However, the source of error here is that the gland of an animal, especially when artificially prepared, cannot be as perfect as the secretions of the human body functionating in their normal situations, but perhaps in deficient amount or impaired in potency by one cause or another. Clearly the best thing would be to repair the blood stream, its oxygen carrying powers, the secretory activities, and the energy of the central nervous control mechanisms.

All catabolism, acute and chronic, is admitted to depend upon a minus position of oxygenation. Whatever enhances the oxygen supply makes for repair. Unless the lungs and heart are competent, at least in chief part, full health cannot be maintained, and more particularly when infection progresses destructively in pulmonary disorders. In cardiac defects all the great organs suffer stases with consequent vitiation of secretion and excretion.

First, of the lungs, most pulmonary disorders are of infectious origin, even the milder forms of bronchitis. The toxic effects in the blood, secondary to these infective agents, are overcome in proportion as the lung remains competent to exercise its function of oxygen absorption and primary distribution. When by reason of the destructive action of catabolic products, or by mechanical or other interferences, the supply of oxygen is defective, we do not hesitate to use oxygen gas by inhalation. Again, in those who possess exceptionally well developed lungs recovery is more prompt and complete. In a very large class of patients the thorax lacks much of full competence, of normal development. These are those who cause us most concern.

It is my observation that far less difficulty exists in taking in air than in expelling the vitiated complemental air. In many people

renewal of the residual air is rarely or never adequately achieved. In proportion as this air is expelled do we get rid of the pulmonary excreta, many of which are most offensive. Cough, the effort of nature to hasten this, is thus relieved. Cough is the phenomenon of irritation, and is not confined to local effects on the air-passages, but other factors contribute, especially toxic vitiation of the blood stream. Cough is a common phenomenon of cardiac disease and of many other organic derangements. Again, the vasomotor function must be reckoned with, and the potency of the adrenal gland has been shown by Sajous to be forceful to an overwhelming degree. The whole of modern hæmatological research makes it clear that oxygen carrying to the tissues is a subject which we must appreciate and control, if possible. Here thoracic competence takes first place, even in advance of digestive competence. Digestion and respiration are mutually interdependent, but it may be a novel view to regard digestion as definitely influenced by thoracic competence and activity, but the truth of this can be plainly demonstrated.

Oxygen must enter the blood in adequate amounts and chiefly through the lungs. In proportion as this is accomplished and distributed does the organism recover from whatsoever malady prevails. Does it involve any peril to encourage the patient suffering from an acute or chronic disease of the bronchi and lungs to voluntarily increase the depth and fulness of inspiration? I think it is improbable. If it should do so it is most likely that any ill effects would be only temporary, and physicians could determine when to exercise caution. Should this very remote and possible peril prevent our encouraging the ingress of more air than is automatically inspired, especially in view of the undeniable benefits which must follow this increased dosage of an absolutely necessary and altogether natural and rational food, or however one may describe oxygen? My experience so far leads me to answer emphatically in the negative. It is not a large one among advanced cases of tuberculous diseases, but I hope that those who are better supplied with opportunities will make further observations. It is tempting in this connection to advert to the shape of the chest as an index of lung power and resist-

ance to tuberculosis or pneumonia. But this must be reserved for a later communication. My experience lies most largely among children and neurasthenic folk, among many of whom the conformation of the thorax is originally defective as well as acquired. I have learned much from the convincing and brilliant researches of Woods Hutchinson on thoracic index. One practical conclusion I am inclined to draw from personal observation is that in those individuals who suffer most from persistence of pulmonic and cardiac disorders the shape of the chest is infantile, deficient in normal wholesome development.

For many years I have given much attention to the development of the chest of those who consult me, young and old. This has been followed so often by clearing away of long standing disorders of lungs and heart and of conspicuous improvements in many other directions that I am inclined to emphasize the importance of respiratory education in most persons ill or well.

The applicability of respiratory education to sufferers from cardiac disorders, while warranting discussion, may only be mentioned here. The whole cycle of circulatory and tissue lymph stases, water logging, in this class of cases is familiar to all. A few final words should be said as to the objects to be attained.

In most persons the mobility of the thoracic walls is conspicuously defective. The ribs in middle aged people have lost in great part their normal hinge like action. This demands full rhythmical breathing, both forceful or at least emphatic, inspiration and expiration. The rate of the breathing should be, first, that which is comfortable, about five seconds in and seven seconds out, and then increased in length gradually until full inspiration can be rhythmically increased to twenty or more seconds in and twenty-five seconds or more out. The apices of the lungs are well known to be only rarely fully distended, and by reason of disuse and consequent defects of nutrition readily become the seat of infection. This apical development should be secured in every one, especially in those whose disablement, by pneumonic or cardiac disorder, discourages or forbids active exercise. The whole subject of pulmonary or thoracic competence warrants discussion, but these hints must now suffice. The valuable effects which

breathing exercises are capable of producing upon the digestive organs are not so well known. When it can be demonstrated, however, that through the concomitant action of the external abdominal muscles and diaphragm powerful effects are wrought upon the liver, the gall bladder, the abdominal viscera generally, especially the intestines and stomach, few will fail to recognize their potency. In short, by proper breathing exercises, as I understand them, not only the thorax, but the abdomen is involved in systematic activities. It is not easy to describe the practice or methods, but it will be attempted briefly. The patient may lie, sit, or stand, and the physician should explain that the thorax should be held so that the ribs are as nearly at a right angle to the vertebral column as feasible, and that the act of breathing shall be performed chiefly by the expansion and contraction of the lower ribs, which should acquire an increasing mobility and range.

In expansion the whole chest should enlarge symmetrically, with no marked protrusion or tension of the abdominal tissues. It should fill up steadily toward the apex, and when no further expansion can take place there the sides should then inflate in all directions, but without much downward pressure on the diaphragm. After holding the air in the chest at the highest point of tension for a few seconds, expiration should begin by the indrawing of the umbilicus and the force shared in by all the abdominal muscles which can be elicited in the act, the chest still held high, and a steady compression exerted upon the diaphragm chiefly. When the abdominal muscles have contracted to their full capacity the lower ribs follow, and finally all the air which can be expelled is extruded. A practical point which I find sometimes of value is that at the end of expiration a slight cough may be encouraged which seems to finish the act. Indeed, at first this forceful extrusion of air is usually followed by several coughs ; soon this ceases. The possibilities of variation in the methods along these lines are remarkably large.[1]

[1] Although practising and teaching this for many years, I found myself a veritable tyro-some time ago when a lady, a teacher of physical education, gave me so many new and valuable principles and practical hints that I hope she will put her knowledge in print. This is Miss Martha Smith, of Philadelphia. She takes a rather different viewpoint, emphasizing the pyschical effects over the physica..

The effects upon digestion of rhythmic breathing are gratifying beyond original expectation. Constipation yields better than to any other agent known to me. Lymph stasis of the abdominal regions, obesity, visceral ptoses are conspicuously modified. It is an obvious corollary that personal appearance consequently improves not only from the repair of organs and tissues through lymph cleansing, oxygenation, etc., but the psychical effects, the regeneration of central nervous energy, are most gratifying.

My friends accuse me of overenthusiasm in accrediting larger effects to respiratory education than to standard methods, drugs, etc., but it is a matter which is plainly demonstrable and entirely rational. To be sure, one man may use an agent with greater effect than another, but it behooves the man who determines to get the best results, where life and health are at stake, to omit the skilful use of no instrument so exquisite and practical as the latent powers of the organism. If the lungs are so important as we are led to believe, and if they so readily suffer disrepair, it is plainly our duty to learn how they can be brought up to their highest efficiency and maintained there, and this is to be accomplished by a critical study of thoracic development.

DISCUSSION.

Dr. Rochester: I want to heartily second the remarks of Dr. Taylor in regard to the management particularly of circulatory disturbances by means of properly directed massage and exercises, and the very great harm that can be brought to those cases by improperly directed massage and exercises; and this has been brought to my mind very decidedly of late by certain cases that have been referred by other physicians to a certain demonstrator of massage in my native town, where they have simply been sent to this person to receive massage. Well, this person has given massage and pretty nearly knocked the patient to death at the same time without having been directed in any way; but I do think that the careful study of these cases and the careful prescription of the character of massage or the character of movements are of the utmost importance, and that it is almost never worth while, in cases of cardiac incompetency, to begin with any sort of active movements; but we have to begin with not only passive movements, but with assisted movements, before

we can begin with resisted movements and raising of weights, etc., which are of great value in circulatory disturbances. I think the chief value of Nauheim is more from the movements they give them than from the baths. I have sent quite a number of cases there and also treated them by baths at home, made after the prescription of these Nauheim baths, and I really think that the chief value is from the careful handling of the patients by movements rather than by the baths themselves.

Dr. Babcock: I desire very heartily to commend what has been said on this subject by the essayist and by Dr. Rochester. It has been for some time my habit to prescribe so-called medical gymnastics, which consisted of breathing exercises and resistance exercises, not only for cases of threatening cardiac incompetence, but in many cases of actual loss of compensation. We are fortunate in Chicago in having a number of persons who are skilled in the application of this mode of treatment, and I am growing year by year in the habit of recommending it to patients. I have seen very brilliant results accomplished in many cases of chronic myocarditis where there was no mechanical obstruction in the way of valvular disease, but merely the cardiac inadequacy resulting from loss of proper equilibrium in the circulation and from degenerative changes in the heart muscle. I have seen men who were suffering from dyspnœa and other manifestations of circulatory disturbance restored to what they considered as good health as before they had any premonition of impending disaster. I think it a measure that we should all consider. It is along the line of the means provided by nature, and, so far as we can, we should endeavor to prescribe therapeutic measures which are not medicinal.

Dr. Jacobi: There is a good deal in the Nauheim baths if only on account of the large amount of carbonic acid contained in them. The carbonic acid you can have in other mineral springs, too. You have them, for instance, in Pyrmont, Schwabach, Spa (Belgium), and so on, in large quantities. The effect of carbonic acid is so well recognized that a number of watering places, for instance, many in the Black Forest of Germany, add artificially prepared carbonic acid to their baths. Another certain means of relieving pain has been found—is to be found now and then—in unreported places. I remember to have seen in a little book of that famous old Scotchman, Dr. Keith, the following remark: that he treats angina pectoris very frequently with massage of the intercostal nerves. The massage is a local one, and he asserts that very frequently he relieves or remedies attacks of angina pectoris by simply massaging the fifth and sixth intercostal nerves persistently, but gently, for some time. All this speaks for the value of massage when done gently and properly. That is so true that in New York City, as far as I am informed, more harm than good is done by so-called massage. There are hundreds of people, male and female, that make a living out of causing new attacks of

pleurisy, new attacks of peritonitis and perimetritis, and so on. They are very active, and, from a commercial point of view, they are great aids to the active practitioner who has to see their cases afterward. I have seen a great many cases of peritonitis that were the result of violent "massage," but this experience of Dr. Keith's is a very interesting one, and it has appeared to be of some service in quite a number of cases of angina.

Dr. Quimby: Just a single word in support of Dr. Taylor's proposition in reference to respiratory exercises. We are often inclined to think that a patient who is told to breathe—given respiratory exercises—simply does it for the certain length of time that he is under training. While it is perfectly true that respiration is an absolutely reflex act, in my experience patients who have been made to breathe properly for a certain length of time find that afterward their respiratory muscles go on breathing properly when they let them alone. The effect of respiratory exercises is not limited, therefore, to the simple time of the lessons. Not only are the respiratory forces augmented; not only is the lung expanded, but the respiratory centres are trained to a better form of reflex action.

Dr. Rives: One point that Dr. Rochester brought up I find I cannot agree with, in regard to which I have had some experience. I have been to Nauheim several times, and my personal impression is, from what I saw there of the results of treatment, that the effect of the baths was remarkable in diseases of the heart, and that the improvement was due more to them than to the exercises; but I should like very much to hear what Dr. Babcock would say on that subject.

Dr. Babcock: I have had considerable experience in this line of treatment, and although I cannot formulate any very to me trustworthy notions concerning the method or the relative value of the effects produced by the resistance exercises and the baths, I am satisfied there are some cases which are benefited by the one and some which are benefited by the other. As a rule, I generally combine them. I am not at all in sympathy, as perhaps you know, with Besley Thorne, Schott, and some others who advocate the baths in cases of very seriously destroyed compensation. I am sure, however, that carefully given resistance exercises will accomplish very much in cases of very grave cardiac inadequacy. I am sure, also, that resistance exercises are a very material aid in relieving angina pectoris, not so much during the attack perhaps (as I have had no experience in that), but given between attacks they relieve patients from frequency and severity of attacks. Both these therapeutic measures are well worthy careful study by every man who is interested in therapeutics of circulatory derangements; and I am sure that if properly given they will afford results which in many instances are far superior to the drug treatment of these diseases.

Dr. Rochester: Might I answer the grounds on which I made my statement? They are these: I have never been at Nauheim, so I am unable to say personally from experience there what the results might be; but I have sent patients to Nauheim and have imitated the baths at home—both the carbonated bath and the non-carbonated, purely saline baths. Three patients who have been at Nauheim and who had undergone the course of treatment there of six weeks and then a rest and return for six weeks' further treatment, which is the one they had recommended, as I remember Schott's original advice, on their return were not particularly benefited by their residence at Nauheim; they came home in about the same condition as they were before they went away. Then I put them simply on a course of careful watching and carefully administered, not restricted movements, but stretchings, complete rest, and carefully assisted movements, and, finally, resisted movements and active exercises; then the patients improved to a very material degree and got well, and are still living in a very comfortable condition. Those are three cases in which the baths failed absolutely to be of any use, although administered at Nauheim. I further used baths at home, and there I have not had the good results from them that I had hoped to get; but I have had good results where I have used the exercises in that sort of order. I think of very great importance, however, is the rest first. We have to put a great many of these patients absolutely to bed without any exercises of any sort at first, and then to begin the massage and the assisted movements, and, finally, the resisted movements and the exercises.

Dr. Babcock: If I am not imposing on the good nature of the members I would like to say, *apropos* of Dr. Rochester's last remark, that I believe in many cases it is absolutely necessary to prepare the patients for the administration of a course of baths, and that it is a mistake to plunge every patient who manifests cardiac disturbance into the bath-tub. I should like to ask Dr. Rochester to whom his patients went or under whose care they were?

Dr. Rochester: The first two cases were under Schott, and the last one went to someone there; I do not know who it was.

Dr. Babcock: There is a great difference in the care manifested to patients in Bad Nauheim. There are some men there who are extremely skilful and conscientious in the use of that method of treatment, and I can heartily recommend Groedel as one of them. There are others, as I happen to know by personal experience and the experience of patients, who are altogether too routine in their method of administering and prescribing baths at Bad Nauheim, and who do not give their patients the particular directions concerning their mode of life and habits, which I believe is essential in addition to the special treatment.

Dr. Quimby: I have not had a large experience in the Nauheim bath, but if I may give an impression it is that the cases which are suffering more from

the nervous side, or the toxic side, perhaps, are the most benefited by the bath treatment; that those in which the cardiac muscle is weaker are more particularly benefited by the treatment of the resistance exercises; but there is not one of this class that cannot be put into the pneumatic cabinet and relieved in less time than it takes to reach Nauheim. There is no case of cardiac trouble that it is not safe to put in the cabinet.

A CLASSIFICATION FOR CASES OF PULMONARY TUBERCULOSIS AND PHTHISIS.

By KARL VON RUCK, M.D.,
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The Committee on Nomenclature of the American Climatological Association recommended the following classification of cases, and of results of treatment in pulmonary tuberculosis, in their report of May 12, 1903.

Suggested Classification for Cases of Pulmonary Tuberculosis.

Incipient. Slight physical and subjective signs, with history indicative of pulmonary tuberculosis. Sputa, if present, without bacilli.

First Stage. Definite physical signs of localized infiltration; total involvement less than half a lobe, whether at one or more points; cough and expectoration with bacilli; constitutional symptoms slight. (In disseminated cases expectoration and bacilli may be absent, with constitutional symptoms more severe.)

Second Stage. Infiltration of single or multiple areas approaching or equal in amount to one lobe; or smaller areas in stage of softening; cough and expectoration with bacilli; constitutional symptoms severe.

Third Stage. Infiltration in excess of one lobe or, if less, in stage of well-developed excavation; more severe constitutional symptoms.

Classification of Results of Treatment in Pulmonary Tuberculosis.

Progressive. All essential symptoms and signs continue unabated.

Quiescent. Constitutional symptoms slight or entirely absent; physical signs improved or unchanged; cough and expectoration with bacilli still present.

Arrested. Absence of constitutional symptoms; expectoration and bacilli still present; physical signs may or may not persist; foregoing to have existed for at least three months.

Apparently Cured. All constitutional symptoms and expectoration with bacilli absent for a period of three months.

Cured. All constitutional symptoms and expectoration with bacilli absent for a period of two years under ordinary conditions of life.

In this classification the committee fully recognized the necessary shortcomings of all classifications, but expects from its adoption a mutual agreement in the use of terms, by which something approaching harmony will be attained in records and reports by the members of the Association.

By a motion carried upon its receipt by the Association, a copy of the report was submitted to members with requests for opinions upon the same.

The attainment of the object which the Association seeks in securing uniformity in classification appears to me of the greatest importance for every student of pulmonary tuberculosis, and an agreement in regard to it is to-day of greater importance than ever, in the light of the activity shown in every civilized country in the combat of this disease.

When only one or a few cases are the subject of a report it is possible to add sufficient details to enable an approximate estimation of their clinical features. In larger series of cases this is less feasible, and for some purposes of prognosis, in certain stages, and for the judging of the value and for comparison of therapeutic measures, it is essential that large numbers of cases be

brought together in certain groups corresponding clinically as nearly as possible.

The natural desire to make such classification concise, in order to avoid confusion, has governed most authors in the past, and is also apparent in the one under consideration; but no matter whether the basis for the classification was purely a clinical one, or one that depended chiefly upon physical signs, all such concise methods have been found deficient, because it is impossible to bring the phases and stages of a disease having so complex anatomical alterations and so varied a clinical course as phthisis is acknowledged to have, under two, three, or four comprehensive groups that have approximate uniformity in local alterations, intensity of degree of constitutional impairment, and in their prospective future course.

Prior to the discovery of auscultation, phthisis was divided, as a rule, into three stages: an early or beginning stage, a middle or confirmed stage, and a last or terminal stage, all of which depended on the degree of constitutional impairment and intensity of existing symptoms. Such a classification was used by Andral[1] and by Bayle,[2] the latter adding also a pre-phthisical stage, which he held to exist before the appearance of clinical symptoms, and in which the local alterations had not assumed a sufficient extent or degree to produce them.

Although Laennec[3] introduced a division in which the anatomical lesions, as shown by the physical signs, were the chief feature, the clinical manifestations as the chief element of division have nevertheless been considered as most important by many authors since his time. Thus Grancher,[4] in 1890, still adhered to Bayle's division, especially emphasizing the pre-phthisical stage, which would properly correspond to one of pure tuberculosis of the lung before the advent of phthisis proper.

Penzoldt[5] also recognizes clinical forms by dividing them into beginning, progressive, and stationary. Prior[6] divides his stages into incipient, confirmed, and consummate, while Musser[7] adopts a clinical basis for his division of acute, pneumonic, and chronic ulcerative forms.

West[8] says that not the anatomical lesions as determined by

physical signs, but the constitutional and clinical conditions are of importance for prognosis, and upon the latter basis differentiates between an acute, a subacute, and a chronic course.

Cornet[9] distinguishes in three stages the customary clinical divisions—incipient, softening, advanced, according to the severity of symptoms.

Adhering to Laennec, we find classifications which attempt to combine, to a greater or less degree, the clinical symptoms with the physical signs. Such classifications are those of Sir James Clark,[10] of Stokes,[11] and of Louis.[12]

The more, however, the prognostic features were deemed essential, the more it became necessary to make more stages or to make subdivisions, and among more recent authors we find Meissen[13] introducing a pre-phthisical or what he calls his "prophylactic" stage, and adding a final decidedly hectic or hopelessly advanced stage to the customary three, with subdivisions for each according to the presence or absence of fever. A similar classification is that of Schroeder and Mennes.[14]

Delafield[15] finds himself obliged to make four great clinical divisions and to introduce seven subvarieties for the chronic miliary form of tuberculosis, according to the anatomical lesions and associated symptoms.

A. L. Loomis[16] made two large clinical divisions between acute and chronic forms, with an anatomic basis for three subdvisions of chronic phthisis, the pneumonic, the disseminated, and the fibrous, and further divides each of these into early and advanced stages.

Percy Kidd[17] has five subdivisions for chronic phthisis, according to the mode of onset of the disease, and three subdivisions for the acute forms. More simple again are the classifications of Strümpell[18] with three stages, incipient, cavernous, and disseminated.

Latham[19] distinguishes between two chronic and three acute forms, upon an anatomical basis, and clinically between the early and advanced stages of chronic phthisis, in which he takes into consideration the existing physical signs.

Carrington,[20] of the Fort Stanton Sanitarium, has clearly the clinical side in view when he makes his classifications "good," "bad," and "very bad," while at the same time he seeks to establish a correspondence between these classes and three respective stages based upon physical signs.

On the other hand, many other authors have ignored the clinical features almost entirely, and some absolutely, basing their classifications upon the anatomical lesions as inferred by physical examination of the chest.

To these belong Lebert,[21] Flint[22] (who simply distinguishes two stages, one before and one after excavation), Eichhorst,[23] Brehmer,[24] Hillier,[25] and others.

Finally, we have a number of those who believe that the extent of the area of lung involved should be the basis for classification exclusively, the clinical features being added as existing in the individual case.

The chief exponent of this basis for classification is Turban,[26] and his method has found numerous adherents, especially in Germany.

Kroeniger,[27] however, made such a classification in a report of a large series of cases already in 1895.

Weicker,[28] A. Möller,[29] and a number of other directors of both public and private sanatoria follow Turban in their reports.

Turban limits his first stage to involvement of one whole or two half lobes, with moderate percussion dulness, auscultation showing medium-sized rales.

His second stage includes involvement of a greater area not exceeding that of two lobes, or severer cases with only one lobe involved. His third stage comprises all cases exceeding the second stage.

A. Fränkel[30] prefers a similar division in use by the German Imperial Health Bureau, also of three stages.

First stage: light cases of the disease limited to small and circumscribed areas, especially the apex, and not extending below the clavicle in front, and the spine of the scapula posterior, with or without rales, but not showing consonant rales.

Second stage : cases in which the local process exceeds in extent that of the first stage, but is less than in the third stage.

Third stage : consolidation of an entire or of several lobes, or evidence of cavity.

Dr. Bowditch[31] also takes into consideration the extent of area involved at least in his first two stages, while in them and in the other three stages the clinical features are recognized. In his fourth report of the State Sanitarium, Rutland, Massachusetts, he gives the following division :

Incipient stage : physical signs confined to one or both apices, constitutional symptoms slight.

Marked incipient stage : larger area involved than in incipient, and constitutional symptoms more decided.

Moderately advanced stage : well-marked changes in percussion and auscultation, with more or less constitutional disturbances.

Advanced stage : well-marked areas of consolidation with cavity formation and constitutional disturbances.

Very advanced stage : marked increase of all the above-mentioned signs.

In his fifth annual report of the same institution he, however, dropped the " very advanced stage."

Trudeau[32] divides into only three stages, without exactly defining the areal extent :

Incipient stage : with but slight local and constitutional involvement.

The advanced stage : local disease more extensive, or in an advanced stage, or the local disease may be comparatively slight, with grave constitutional impairment or some complications.

Far advanced stage : both physical and rational signs warranting the term.

H. P. Loomis,[33] as also Stubbert,[34] in the reports of the Loomis Sanitarium, classify alike, distinguishing between incipient, moderately advanced, and advanced stages, and Ashton,[35] as well as Elliott,[36] follows this classification in their reports.

If one examines these various classifications, to which many, more or less decided modifications by other authors could be added, one can see good points in all of them, be they based

upon the clinical manifestations solely, or upon a basis which is purely anatomical, or upon one that is a combination of both.

When one, however, has a larger series of cases to dispose of and intends to classify in a manner in which the anatomical lesions (as shown by physical signs) are attached to certain clinical phases of the disease, then there are cases left over which cannot be disposed of at all, while some of those which have been disposed of under one or the other combination groups are found to differ greatly in prognosis, which, after all, is the real object of all classifications, so far as we use them for statistic and comparative purposes.

A careful study of the classification of stages recommended by the committee of this Association does not appear to me to have sufficiently remedied this serious defect, and I am well convinced that no classification can do this, even approximately, so long as it attempts to combine the physical phenomena, especially in regard to extent of area with the clinical aspect of cases, simply because they stand in no necessary relation, either in the prospect for duration of life or in the prospect for a clinical cure.

Under such circumstances one is tempted to resort to the old method of division into clinical stages only, the more so as the attainment of uniformity on a "physical sign basis" implies, as Turban himself admits, equal training and experience in examination of the chest.

In the classification of my own work, comprising reports of over 3000 cases, I have therefore paid but secondary attention to the physical signs, and have divided my cases into three classes, entirely upon a clinical aspect, from my own standpoint of prognosis.

By this method a case is classified regardless of the fact that there is one or two lobes the seat of demonstrable alterations, while cases with acute or actively progressive changes and caseous pneumonias, or those with more serious complications and of but limited or less acute local lung disease, go where, from a prognostic standpoint, they really belong.

A case recently examined by me in which the greater part of an upper lobe was the seat of caseous pneumonia, with co-existing

parenchymatous nephritis and tuberculous ulceration of the larynx, was naturally placed into the most unfavorable class, whereas, according to Turban, the classification should have been in the first and, according to our committee's recommendation, in the second stage.

While I have found room for improvement in my own classification, especially for making my reports with a view of their ready comparison with those of others, I have made no change in the past, because everyone seemed to classify differently, and I proposed to continue consistently, at least in my own work, until the profession should adopt a standard that we all will follow.

That this standard should reflect the prognosis of the cases grouped together as far as possible, I presume we all are agreed, and the changes made from Turban's classification by your committee can have had no other object.

Being deeply interested in the subject ever since I have become acquainted with the recommendation of your committee for a uniform classification, I have spent much thought upon the subject, and have endeavored to formulate a substitute that should be an improvement, while making the element of prognosis its chief feature.

In the formulation of such a classification I have been aided by the one of Carl Spengler,[37] of Davos, which he has followed for many years and which appears in the volume dedicated to Professor Koch on the occasion of his sixtieth birthday.

Dr. Spengler divides his cases in two large groups, the first being non-febrile, and therefore inactive ; the second group comprises the febrile or active forms of the disease. He then makes three stages under each group :

In the first stage are included only such as have been termed "closed" cases, that is to say, such in which the process is a purely tuberculous one, softening and excavation having not yet occurred.

The second stage is that of early or beginning phthisis, and the third stage that of cavernous phthisis ; and each stage has an inactive and an active group.

For prognostic purposes I believe, however, a division into four stages to be desirable, inasmuch as some cases that would come in the second stage, according to Spengler, ought to be taken out and placed with the third stage, and likewise certain cases that he places in his third stage would with advantage be classed by themselves, since in these the prognosis for lasting improvement or cure is unfavorable.

It may also be deserving of your consideration to emphasize the distinction between pure tuberculosis and phthisis more decidedly by not enumerating such cases with those of phthisis, and by classing them as chronic tuberculosis, while reserving three stages for phthisis proper.

I have made this a feature of the classification which I submit, and believe a careful examination will justify such a course, since an additional etiological factor, largely dominating the future course of the disease, comes into consideration, with the advent of phthisis.

Classification of Stages for Cases of Pulmonary Tuberculosis and Phthisis.

CHRONIC PULMONARY TUBERCULOSIS.

a. Inactive, closed tuberculosis, latent form, free from fever, reacting to tuberculin, with varied extent of physical signs.

b. Active, closed tuberculosis, with mild tuberculous fever (100.5° maximum); otherwise same as *a.*

PULMONARY PHTHISIS.

Class I. Non-febrile Cases.

First Stage. Inactive, initial phthisis, without demonstrable cavity formation, with bacillary sputum, total quantity not exceeding one-half ounce in twenty-four hours; passive secondary infection, with or without mild complications, on the part of the pleura. Temperature normal to 99°.

Second Stage. Inactive phthisis, with single, small demonstrable cavity formation. Expectoration not exceeding one ounce in twenty-four hours. Passive secondary infection, with or without mild complications on part of the larynx or pleura, or both. Temperature normal to 99.2°.

Third Stage. Inactive advanced cavernous phthisis, with large or multiple cavity formation. Expectoration exceeding one ounce in twenty-four hours. Passive secondary infection; serious complications, tuberculous or otherwise, on the part of larynx, pleura, intestine, or other organs. Temperature subnormal to 99.5°.

Class II. Febrile Cases.

First Stage. Active initial phthisis, with moderate tuberculous fever, or a combination of the tuberculous with that of subacute secondary infection. Expectoration not exceeding one-half ounce in twenty-four hours, with or without mild complications on part of pleura. Temperature not exceeding 101.5°.

Second Stage. Active phthisis, with tuberculous fever or combined secondary fever; demonstrable cavity formation. Expectoration not exceeding one ounce in twenty-four hours. Mild complications on part of pleura and larynx, or both. Temperature not exceeding 102.5°.

Third Stage. Active advanced cavernous phthisis, with tuberculous or secondary fever of any degree. Large single or multiple cavity formation. Expectoration exceeding one ounce in twenty-four hours. Complications same as under *Non-febrile Cases*, or caseous pneumonia, diffused mixed infection, acute miliary disseminations.

Classification of Results of Treatment of Pulmonary Tuberculosis and Phthisis.

Cured. Patients free from all subjective symptoms, without elevation of temperature, without cough or expectoration. Physical signs absent or indicative of connective-tissue changes or cica-

trization. General health restored. Tuberculin test applied three months or later after discontinuance of treatment must have proved negative, or above conditions must have been maintained at least for two years after discharge.

Apparently Cured. Same condition as above, maintained at least for three months after discontinuance of treatment.

Disease Arrested. Decided retrogressive changes in the physical signs, co-existing with corresponding amelioration of symptoms, only slight cough remaining, expectoration not exceeding two drachms in twenty-four hours, still containing tubercle bacilli. General health to be approaching normal state. Temperature must be practically normal, not exceeding 99°. Such condition must have been maintained for three months or longer.

Greatly Improved. Symptoms and physical signs present on admission must show material reduction, especially cough, expectoration, and fever. Weight and strength, if previously deficient, must show decided increase.

Improved. Symptoms, such as cough, expectoration, and fever, have grown less. No loss in weight, or gaining on discharge.

Stationary. No material change in patient's condition. No loss in weight.

Progressive. Symptoms and physical signs are increased.

Some may object to the division of each stage into an active and inactive form, thereby really distinguishing between eight classes instead of three or four, as has been the common custom. I believe, however, that for purposes of prognosis this division is unavoidable, and also that when one familiarizes himself with the divisions it will not be found a hardship to observe them.

Dr. Spengler's condition of absolute freedom from fever for inactive stages of phthisis I could not think practical, for there are few cases which, while they have a considerable amount of secretions from ulcerated surfaces or cavities, do not show a slight rise at some time during the day, although there is no apparent active or progressive tendency.

A further objection may be urged for the necessity of distinguishing between the sizes of cavities in classifying between

Stage 2 and 3. It is true that this may become a difficult matter in some instances, but I believe that the sputum quantity will aid considerably in this respect, since it represents with a great deal of uniformity the extent of area of suppurating surfaces from which it is derived.

Large cavities are, however, easily found, and their prognostic feature lies chiefly in the fact that they rarely can be caused to close without resort to surgical measures, at least not in adults; therefore these cases cannot attain a clinical cure.

You will observe the following to be the chief distinctive features for the classification :

For Chronic Tuberculosis: the absence of softening, ulceration, or excavation.

For Initial Phthisis: that the destructive area is small, giving as yet no physical signs of cavity and having a correspondingly limited amount of expectoration.

For Phthisis: that the destructive process has extended to a degree that a small-sized cavity is recognizable, the increase of the ulcerating surface corresponding with an increase of sputum. In this stage the larynx may show a mild degree of involvement.

For Advanced Cavernous Phthisis: the presence of a large or of multiple cavity formation again reflected by a correspondingly larger amount of sputum. With this stage are also classed all cases which, regardless of the extent of local destructive changes, have co-existing grave complications, be they tuberculous or otherwise.

We thus dispose of the occurrence of amyloid degenerations, of grave diabetes, of nephritis, and of certain rarer complications on the part of the heart, that may be a feature in any stage of the disease, and likewise of cases of acute caseous pneumonia, diffused mixed infection, acute miliary dissemination, etc. The differentiation of the actively progressing from the inactive non-febrile cases is also of obvious advantage.

While this classification is chiefly upon a clinical basis, it reflects the gravity of the cases grouped together, and has the great advantage that it requires no extraordinary skill and experience in placing a given case in its proper group.

A word yet I would like to add in regard to the classification of the results of treatment.

If we look at the customary classification of results, especially of American reports, we find a fair degree of uniformity, although all classifications in use could be improved by adoption of more reliable criterions.

Dr. Bowditch is reluctant to make a class of apparently cured cases, and, until his last report of the Massachusetts State Sanitarium, he has substituted the word arrested, as an equivalent. In the last report, made jointly with Dr. Clapp, the arrested and apparently cured cases are classed together in the same sense and with the same conditions as to results obtained. In addition, he makes only one more class representing every shade of improvement.

Trudeau's class of "apparently cured" corresponds to Dr. Bowditch and Clapp's cases; but, like all others, he makes a special class for arrested cases, in which cough and expectoration with tubercle bacilli are still present, but constitutional disturbances must have been absent for several months, and the physical signs must show a retrograde or arrested progress. Besides, he has an improved class.

In the Loomis Sanitarium, as also in the Muskoka Cottage Sanitarium, Trudeau's classification prevails, and in my reports from the Winyah Sanitarium, I have followed it, while I have made two classes for improved cases, according to the degree of benefit attained.

I believe, however, that if we adopt a uniform standard for the classification of results, we can define more accurately the requirements for each group.

For cases actually claimed as cured there should be no symptoms of any kind, and the result of physical examination should be negative or give no other evidence than that of connective tissue or cicatricial changes. But instead of a time-limit of two years, a negative tuberculin test after three months from date of discharge should be accepted; in fact, my own opinion is that this should be an invariable condition. In addition, the state of the patient's general health should be consistent with a recovery.

For an apparent recovery the conditions must necessarily be the same, or else the recovery cannot be said to be apparent; it becomes unconditional only after a tuberculin test or on expiration of the time stipulated for a cure.

I find very little difference between the "arrested" and the quiescent classes in the classification submitted by the committee. In the quiescent class constitutional symptoms may be and in the arrested class they must be absent. In the former cough with bacillary expectoration is mentioned, and in the latter expectoration containing tubercle bacilli may still be a symptom, and, since cough implies expectoration, and expectoration is usually attended with cough, both classes may still cough and expectorate tuberculous sputum in unlimited amount. The same uncertainty prevails in regard to the physical signs; in the quiescent class they may be improved or unchanged, while in the arrested class they may or may not persist.

The real difference is therefore that in the arrested class there is a provision of time for which the condition has been maintained.

If you will examine the requirements I have made for arrested cases I believe you will agree with me in the desirability of limiting the temperature to be practically normal; likewise that the cough and expectoration shall be slight, as stated, while the physical signs must show retrogressive changes.

To prevent confusion I left out the quiescent class entirely, and substituted a stationary class in its stead, that is to say, one in which there has been no apparent improvement as a result of treatment, while the patient has held his own.

Between this stationary class and the arrested one, I found it necessary to make some provision for improved cases, which on discontinuing treatment have not attained enough benefit to meet all the conditions that justify their inclusion among arrested cases.

The difference between a cured and an apparently cured case is that the former has proved his cure by a tuberculin test or by the expiration of two years of good health without return of symptoms.

Between the cured and the arrested cases the chief difference is that there may be in the latter a still open surface discharging a limited amount of secretions which is inconsistent with the acceptance of a cure.

Between these and the improved cases the classification represents the degree of benefit derived from treatment, and while in arrested cases this degree is more sharply defined, the improved state is evidenced by changes for the better, which are a matter of comparison between admission and discharge.

With these remarks I submit to you the classification suggested for your further consideration.

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